Comparative Study of Biofeedback Therapies for Tension Type Headache Treatment and Enhancing Capacity towards Psychic Challenges

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DECLARATION

Research Area: Machine Intelligence on Spiritual Well Being & Mental Fitness

2 Topic of Research Work: Comparative Study of Biofeedback Therapies for Tension Type Headache Treatment and Enhancing Capacity towards Psychic Challenges.

3 Introduction:

3.1 Happiness Index and Better Life:

Indeed, today, life satisfaction and happiness are central research areas in the social sciences, including in 'mainstream' economics [2]. (Fig.1)

Self-reported life satisfaction correlates with other measures of well-being—richer and healthier countries tend to have higher average happiness scores. [2]

As we can see, in the majority of countries the trend is positive: In 49 of the 69 countries with data from two or more surveys, the most recent observation is higher than the earliest. In some cases, the improvement has been very large; in Zimbabwe, for example, the share of people who reported being 'very happy' or 'rather happy' went from 56.4% in 2004 to 82.1% in 2014. [2] (Fig.2)

Fig.1 Self Reported Life Satisfaction survey 2016

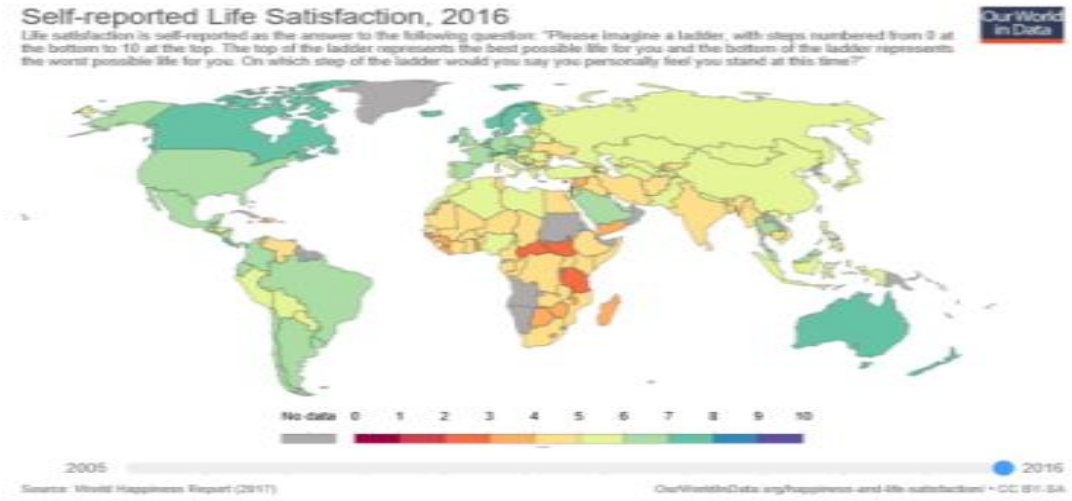


Fig.2 Share of Peoples in Different countries whose Happiness Index is High

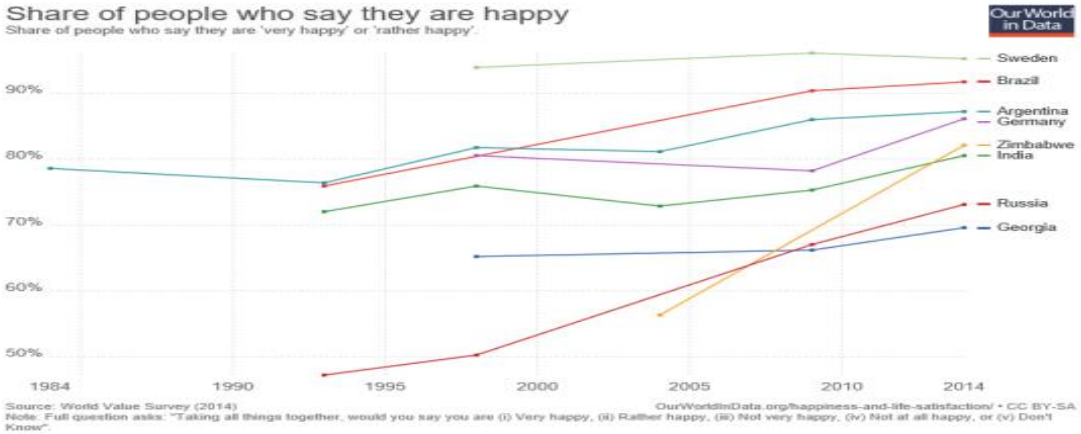


Fig.3[7] Country Shares and Survey who are Very or Fairly satisfied globally

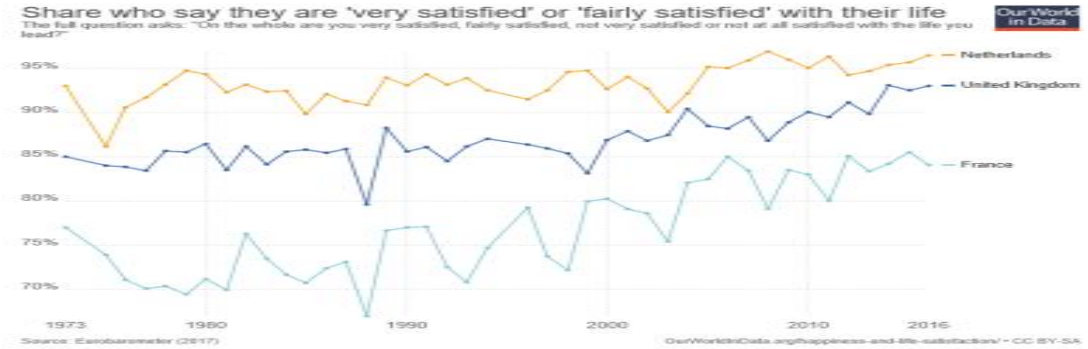
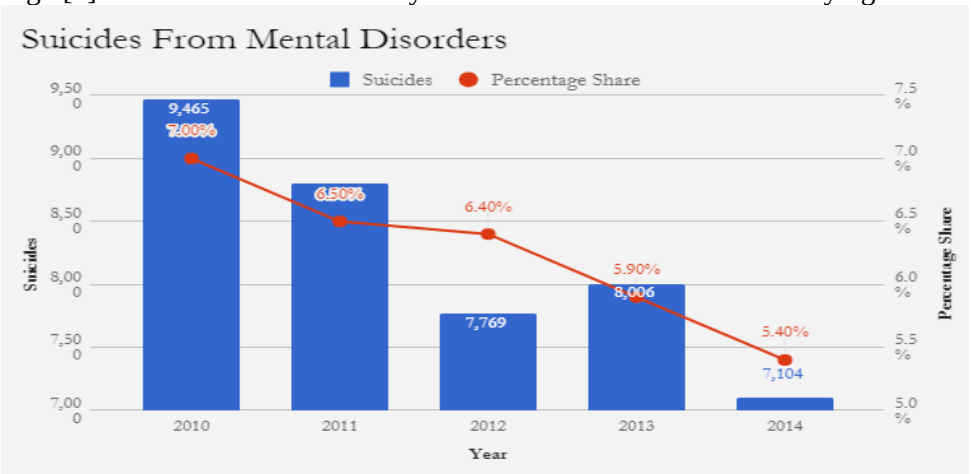


Fig.4[5] Suicide Ratio in different years from mental disorders-a worrying sate



See Appendices '**A'** for

A.1 Intelligence of Machines and our 'Aatmik Abodhita'(Self Ignoranance)

A.2 Changes in Happiness over time—Findings from Eurobarometer

A.3 Life Satisfaction

4 Need to Study IQ, EI and SI:

The word 'Intelligence' is as old as human existence and symbiotically associated with thinking skills that distinguishes an individual from another and most importantly a predictor of life adjustment in the society. Anyone who scores low on the scale of cognitive intelligence otherwise known as intelligent quotient is taken to be a low achiever, dull, indolent, stupid and grossly maladjusted.

However, psychologists have identified many more areas of intelligence apart from the original one (cognitive intelligence), which include: fluid intelligence, crystallized intelligence, social intelligence, emotional intelligence, spiritual intelligence, financial intelligence etc. which are all indices of adjustment (Salovey and Mayer 1990; Goleman 1996; Zohar and Marshall 2000; Animasahun 2003; Jimoh 2007). [8]

4.1 Need for Our Study

Pharmacotherapy remains the mainstay of treatment for all types of headaches and vast amounts of prescription and over-the-counter medications are used. Side effects frequently occur with these medications which at times can be life-threatening. The medications themselves often contribute to the reduced productivity among headache sufferers. [9]

A number of treatment strategies used in the treatment of TTH (Tension Type Headache), either in isolation or combined with one another. These consist of pharmacological treatment, physical therapy, acupuncture, relaxation therapy or alternative medicine. Biofeedback though has proven its efficacy in the treatment of TTH, is not widely used in India by health professionals.

Biofeedback therapy is still a novel and an infrequently used therapy for treating practitioners as well as the common people in India. Therefore, a study of this nature is required to create an awareness of this field of therapy among the health practitioners as well as the community. Of all biofeedback techniques, EMG biofeedback has been extensively studied in the management of TTH. However, despite the fact that GSR biofeedback is used in many other disorders with psychosomatic components in the pathogenesis like hypertension, epilepsy, hyperhidrosis, etc. it has been infrequently evaluated and used in the management of TTH.

Therefore, there was a need to find the efficacy of GSR biofeedback in TTH and also to compare its efficacy with EMG biofeedback in patients with TTH. Need of a novel attempt to study and compare the efficacy of auditory, visual and combined biofeedback in both EMG and GSR biofeedback in TTH subjects. The implications of this may be used in designing and manufacturing of EMG and GSR biofeedback units for therapeutic benefits.

See Appendices **'B'** for

B.1 Common Mental Disorders- A Challenge in India

B.2 Spiritual Tools to meet Psychic Challenges

B.3 Effect of Spiritual techniques on Human Body and Health

B.4 Possible Human Factors/parameters to be measured by Biofeedback

5 Effects of Biofeedback on Stress (Earlier Experiments):

5.1 Tension Type Headache and Stress- Stress is a frequent occurrence in all our lives. It is a state of physiological or psychological strain caused by undesirable stimuli, physical, mental or emotional; internal or external that could likely disturb the functioning of an individual. [13] When stress is being experienced by a person constantly with no relief or with increased frequency, it is termed as "distress". Distress leads to weakened cognitive and physiological control and, as a result, decreased performance. It can lead to symptoms like headache, gastrointestinal disturbances, elevated blood pressure, chest pain, insomnia, peptic ulcers, sexual dysfunction, skin ailments, etc.

The physiological responses to stress may differ with regards to acute and chronic stress. Acute stress generally is short lived and causes no actual damage, whereas chronic stress can cause a sustained response to stress causing damage and chronic pain. Stress reactions (response to stress) cause amplification of physiological parameters such as muscle tension, blood pressure, increased sweating, etc. This causes disorders in the body like headaches, irritable bowel syndrome, ulcers, hyperhidrosis, chest

pain, etc. Eventually, it results into a vicious cycle wherein stress causes pain or stress related disorders and increased pain or other symptoms, which leads to further amplification of stress.

Stress related disorders are often termed as "psychosomatic" disorders which involves the mind and body. These are the disorders in which the mind makes the body vulnerable for disorders. Tension-type headache (TTH) is one of the common and chief diseases in psychosomatic medicine because of its correlation with psychosocial factors. [14]

Mental stress and tension are the most frequently reported triggers of tension-type headache. [15,16] Genetic or family-related environmental factors are also associated with TTH. [17] Major life events such as surgery, divorce and deaths of close family members induce major negative effect. Such events in the prior year have been modestly related to the persistence of headache. [14] In addition to physical variables like muscle tension, electro-dermal activity, temperature, etc. and other demographic variables of pain, psychological risk factors have been empirically associated with the occurrence of headache. These comprise, social support, hypnotizability, affect, life events, and negative thinking.[14] Trait negative affectivity is raised in chronic headache causing over reporting of somatic symptoms like headache pain, irrespective of organic disease.[15,16] This indicates that mental health is largely affected in patients with TTH and therefore a good deal of attention should be paid to the psychological component in terms of assessing and taking measures to improve the mental health of patients with TTH.

Headache is a clinical syndrome affecting 91% of males and 96% of females at some time during their life span. The World Health Organization recognized that primary headaches are among the first 20 major causes of disability. In the primary care practice, tension type headache is the most commonly diagnosed variety of primary headache. Due to tension, formerly called tension headache or muscle contraction headache is the most frequently occurring headache disorder. It is the commonest among primary headaches.

It is the most dominant and costly headache. Tension type headaches are responsible for nearly 90% of all headaches. As per the International Headache Society (IHS), its lifetime occurrence in the general population ranges in different studies from 30 to 78%. In spite of its high prevalence and

regardless of the fact that it has the highest socio-economic impact, it is still the least studied of the primary headache disorders. Population based studies have established that 24–37% of the adult populations have TTH several times a month; 10% have it weekly; and 2–3% have chronic TTH, usually lasting for many years. A study of the global prevalence and burden of headaches showed that the community burden resulting from disability caused by TTH is greater than that of migraine. Tension type headache is more common in women, in a ratio of 1.5:1,[26] whereas other studies have shown that the female to male ratio of TTH is 5:4.

Published estimates of the prevalence of tension type headache vary over a wide range from 1.3% to 65% in men and 2.7% to 86% in women. [27] A World Health Organization (WHO) statement released in 2000 on headache disorders and public health quotes that the onset of TTH is often in the teen and prevalence peaks in the fourth decade and subsequently declines [26], whereas the average age of onset of TTH was found to be 25–30 years in cross- sectional epidemiological studies. The prevalence peaks between the age of 30 to 39 and decreases slightly with age. Some of the risk factors for developing TTH have been reported to be poor self-rated health, unable to relax after work and sleeping few hours per night.

Two Danish studies have shown that the number of workdays missed was three times higher for TTH than for migraine in the population, and a US study has also found that absenteeism because of TTH is considerable. In a study by Fuh et al, 2008 where a cohort study was conducted to study the outcome of elderly patients with chronic tension type headache (CTTH) in a span of 13 years, the authors found 30% of patients with CTTH evolved to chronic migraine (CM) or episodic migraine (EM). Therefore, it is important to curb the tension type headache before it transforms to migraine which could lead to difficulty in treating due to its complex nature. Tension type headache is clinically and patho-physiologically heterogeneous. The complex interrelation of the various pathophysiological factors of TTH; makes this disorder often difficult to treat. Various therapeutic measures have been recommended to be used in sequence or in combination. Therapies for TTH can be subdivided into short term, abortive treatment of each attack (mainly pharmacological) and long term, prophylactic treatments (pharmacological and/or non-pharmacological). [27]

Several non-pharmacological treatments have been recommended for management of TTH, them being physical therapy, [26] craniocervical training, oro-mandibular treatment acupuncture, relaxation therapies, cognitive-training biofeedback etc. However, the scientific evidence for efficacy of most treatment modalities is sparse. [27]

Biofeedback is one of the most prominent behavioral headache treatments. It is an established non-pharmacologic technique commonly used in the treatment of migraine and tension type headaches. Several published studies have suggested that biofeedback is effective in reducing the frequency and severity of headaches, thereby limiting the patient's dependence on medication. Conforming to this, studies have also proposed that biofeedback may affect a reduction in medical utilization in headaches. [29]

5.2 Biofeedback

The term "Biofeedback" was voted against the term Auto regulation in 1969. The organization who coined this word was named the Biofeedback Research Society (BRS). In 1976, the BRS was renamed Biofeedback Society of America (BSA). The present name of the society, the Association for Applied Psychophysiology and Biofeedback came into existence in 1989.

Edmund Jacobson, a physician was one of the earliest contributors in the field of biofeedback. In 1938 he monitored electromyography (EMG) of patients practicing progressive muscle relaxation to find out if the muscles actually relaxed.

Previously, it was believed that autonomic responses could not be controlled voluntarily. **Miller and Leo DiCara** in 1962 demonstrated that curarized rats could learn to control their autonomic functions (breathing patterns, muscle tone, blood pressure, salivation, GSR, etc.).

In 1966, **Joe Kamiya**, who is popularly known as "the father of biofeedback" found that some subjects could learn to discriminate the presence of alpha waves when electroencephalography (EEG) was performed on them. He also found that they could learn to manipulate their alpha frequency by about 1Hz, thus establishing that subjects could control their own neuro-biological rhythm.

Physicians **Marinacci** and **Whatmore** practiced biofeedback even before the term was founded. They used EMG biofeedback to treat stroke patients. But their work on neuromuscular re-education was not continued by others and remained undeveloped till it was rediscovered. Significant contributions to this field have been made by researchers in the clinical aspects like (a) **Basmajin**, who used surface EMG to study role of different muscles in movements and used the information for rehabilitation, (b) **A. Kegel**, who used pneumatic biofeedback devices to train pelvic floor muscles, (c) **Johan Stovya** used biofeedback for treating anxiety and (d)**Thomas Budzynski** used SEMG for treatment of headaches. [22]

The Association for Applied Psychophysiology and Biofeedback (AAPB), the Biofeedback Certification Institute of America (BCIA), and the International Society for Neurofeedback and Research (ISNR) convened a task force of renowned scientists and clinicians in late 2007 who worked together to craft a standard definition for biofeedback. They defined biofeedback as "a process that enables an individual to learn how to change physiological activity for the purposes of improving health and performance." [23] Precise instruments measure physiological activity such as, heart function, muscle activity, breathing, electroencephalogram, skin-temperature etc. These biofeedback instruments rapidly and accurately "feed-back" information to the user. The use of this information, often in combination with changes in thinking, emotions and behavior supports needed physiological changes. [23] Patients with the use of this information (biofeedback) learn enhanced control over the physiological process (operant learning model). [24] Over time, these changes can be preserved without continued use of an instrument.[22] Any learning is facilitated by feedback. The same principle is used in biofeedback therapy whose main aim is to assist the patients in self-regulation of psycho-physiological factors, thereby allowing them to gain voluntary control over physiological parameters. Learned behavioral control over physiological responses was first published in 1961. In the 1960s and 1970s, human studies revealed that through operant feedback methods, voluntary control could be learnt over many physiologic responses (e.g., heart rate, blood pressure, skin conductance, muscle tension, skin temperature, evoked potentials and various rhythms of EEG).

Biofeedback therapies are non-pharmacologic treatments that use scientific instruments to measure, amplify, and feedback physiological information to the patient being monitored, thereby promoting control and manipulation of physiological parameters. It is virtually free of any adverse side effects and therefore seemingly the preferable choice for treatment of psychosomatic disorders. Biofeedback therapy has evolved over the last 30 years, and today there are innumerable disorders for which biofeedback therapy has been used. Biofeedback therapy is now used for a variety of disorders, such as headache (migraine, tension and mixed), urinary incontinence, essential hypertension etc. with reliable results.

Biofeedback, also known as neurotherapy, is a progressive relaxation and self-regulation technique used to control one's own stress level (Wenk-Sormaz, 2005). It works by simply preventing illness through stress management techniques. This treatment promotes the quality of life and sharpens coping skills (Baum, Herberman, & Cohen, 1995). In other words, it is a psycho physiological technique used to promote the overall wellness in the mind and body. [23]

One idea of biofeedback is to reduce stress via self-control (Cassel, 1985). As mentioned earlier it uses defined techniques to reduce tension. These techniques include decision making competency, twilight learning/permissive concentration and autogenic feedback training. If a person can use these techniques to gain self-control they have a better chance of overall wellness. The practice of biofeedback can help reduce chronic pain symptoms (Turk, Swanson, & Tunks, 2008) along with stress symptoms (Clayton, 2005), and serves as an alternative method of healthcare as opposed to drugs. If biofeedback proves beneficial, it is often preferred over prescripted drugs due to the high cost of the medication and its possibility of dependency (Wolf, 1992). [22]

Many previous studies have shown that biofeedback does indeed work, especially in children and young adults (Smith, & Womack, 1987). A study focused in a college setting, showed beneficial to students who practice the biofeedback technique. They attended workshops and worked in individual sessions. Along with attending workshops, they also kept a daily diary. [25]

Along with a stress-control log, and changing their sleeping patterns. The information will be collected and assessed and the students/ technocrats who participated increased their focus and GPA

considerably (Valdes, 1988). Another case study which focused on biofeedback as a form as relaxation training also reduced stress in its participants. The group of volunteers was measured on a self-report scale along with temperature and an EMG. Although the temperature had no effect, the volunteers retained their improvements weeks after their biofeedback training (Schilling, 1983).

5.3 Biofeedback Based Sensor Modalities:

Three professional biofeedback organizations, the Association for Applied Psychophysiology and Biofeedback (AAPB), Biofeedback Certification International Alliance (BCIA), and the International Society for Neurofeedback and Research (ISNR), arrived at a consensus definition of biofeedback in 2008: "is a process that enables an individual to learn how to change physiological activity for the purposes of improving health and performance. Precise instruments measure physiological activity such as brainwaves, heart function, breathing, muscle activity, and skin temperature. These instruments rapidly and accurately 'feedback' information to the user. The presentation of this information—often in conjunction with changes in thinking, emotions, and behavior—supports desired physiological changes. Over time, these changes can endure without continued use of an instrument. [13]

Electromyograph-The "Muscle Whistler", shown here with surface EMG electrodes, was an early biofeedback device developed by Dr. Harry Garland and Dr. Roger Melen in 1971.[17,18] An electromyograph (EMG) uses surface electrodes to detect muscle action potentials from underlying skeletal muscles that initiate muscle contraction. Clinicians record the surface electromyogram (SEMG) using one or more active electrodes that are placed over a target muscle and a reference electrode that is placed within six inches of either active. The SEMG is measured in microvolt (millionths of a volt).[19,20]

Feedback Thermometer- A feedback thermometer detects skin temperature with a thermistor (a temperature-sensitive resistor) that is usually attached to a finger or toe and measured in degrees Celsius or Fahrenheit. Skin temperature mainly reflects arteriole diameter. Hand-warming and hand-cooling are produced by separate mechanisms, and their regulation involves different skills.[22] Hand-warming involves arteriole vasodilation produced by a beta-2 adrenergic hormonal mechanism.[23] Hand-cooling involves arteriole vasoconstriction produced by the increased firing of sympathetic C-fibers.[24]

Biofeedback therapists use temperature biofeedback when treating chronic pain, edema, headache (migraine and tension-type headache), essential hypertension, Reynaud's disease, anxiety, and stress.[21]

Electrodermograph-An electrodermograph (EDG) measures skin electrical activity directly (skin-conductance and skin-potential) and indirectly (skin resistance) using electrodes placed over the digits or hand and wrist. Orienting responses to unexpected stimuli, arousal and worry, and cognitive activity can increase eccrine sweat gland activity, increasing the conductivity of the skin for electric current.[33]

Electroencephalograph-An electroencephalograph- (EEG) measures the electrical activation of the brain from scalp sites located over the human cortex. The EEG shows the amplitude of electrical activity at each cortical site, the amplitude and relative power of various wave forms at each site, and the degree to which each cortical site fires in conjunction with other cortical sites (coherence and symmetry).[34]

Photo plethysmograph-A photo plethysmograph (PPG) measures the relative blood flow through a digit using a photoplethysmographic (PPG) sensor attached by a Velcro band to the fingers or to the temple to monitor the temporal artery. An infrared light source is transmitted through or reflected off the tissue, detected by a phototransistor, and quantified in arbitrary units. Less light is absorbed when blood flow is greater, increasing the intensity of light reaching the sensor. [34]

Electrocardiogram-The electrocardiogram (ECG) uses electrodes placed on the torso, wrists, or legs, to measure the electrical activity of the heart and measures the interbeat interval (distances between successive R-wave peaks in the QRS complex). The interbeat interval, divided into 60 seconds, determines the heart rate at that moment. The statistical variability of that interbeat interval is what we call heart rate variability.[27] The ECG method is more accurate than the PPG method in measuring heart rate variability.[35]

Fig.5 EM-Wave2 photo plethysmograph for monitoring heart rate variability

Pneumograph-A pneumograph or respiratory strain gauge uses a flexible sensor band that is placed around the chest, abdomen, or both. The strain gauge method can provide feedback about the relative expansion/contraction of the chest and abdomen, and can measure respiration rate (the number of breaths per minute).[29] Clinicians can use a pneumograph to detect and correct dysfunctional breathing patterns

and behaviors. Dysfunctional breathing patterns include clavicular breathing (breathing that primarily relies on the external intercostal and the accessory muscles of respiration to inflate the lungs), reverse breathing (breathing where the abdomen expands during exhalation and contracts during inhalation), and thoracic breathing (shallow breathing that primarily relies on the external intercostal to inflate the lungs). Dysfunctional breathing behaviors include apnea (suspension of breathing), gasping, sighing, and wheezing.[36]

Capnometer-A capnometer or capnograph uses an infrared detector to measure end-tidal CO2 (the partial pressure of carbon dioxide in expired air at the end of expiration) exhaled through the nostril into a latex tube. The average value of end-tidal CO2 for a resting adult is 5% (36 Torr or 4.8 kPa). A capnometer is a sensitive index of the quality of patient breathing. Shallow, rapid, and effortful breathing lowers CO2, while deep, slow, effortless breathing increases it. [33]

Rheoencephalograph- Hemoencephalography or HEG biofeedback is a functional infrared imaging technique. As its name describes, it measures the differences in the color of light reflected back through the scalp based on the relative amount of oxygenated and unoxygenated blood in the brain. Research continues to determine its reliability, validity, and clinical applicability. HEG is used to treat ADHD and migraine, and for research.[31]

Pressure-Pressure can be monitored as a patient performs exercises while resting against an air-filled cushion.[32] This is pertinent to physiotherapy. Alternatively, the patient may actively grip or press against an air-filled cushion of custom shape. [33]

5.4 Biofeedback in Tension Type Headache

Enormous research carried out in the mid-20th century on stress and illness, formed the basis, needed to establish headache as a psycho-physiological disorder, thereby justifying the application of contemporary behavioral headache treatments. Over the past thirty years, these behavioral treatments for headache have gathered a sizeable evidence base.

Budzynski and colleagues were the first to publish demonstration of biofeedback for tension headache treatment. They developed the EMG biofeedback model and protocol for tension headache [30] and pursued to demonstrate initial headache improvements in uncontrolled and controlled experiments. The American Headache Society recognized biofeedback as a valid form of headache therapy in 1978. The U.S. Headache Consortium, which was a multi-disciplined assemblage of seven professional practice organizations also endorsed behavioral therapy including biofeedback for headache as important evidence based treatment. [12] Meta-analytic reviews of the literature consistently have shown behavioral interventions to yield 35% to 55% improvements in migraine and tension-type headache and that these outcomes are significantly superior to control conditions. The positive evidence from these studies has led many professional practice organizations to recommend use of behavioral headache treatments alongside pharmacologic treatments for primary headache. [12] A Task Force of the association for Applied Psychophysiology and Biofeedback and the Society for Neuronal Regulation was formed in 2001, which developed guidelines for the evaluation of the clinical efficacy of psycho- physiological interventions. The criteria for levels of evidence of efficacy was laid down and approved by both associations. These criteria were used to assign efficacy levels for the vast number of conditions for which biofeedback has been used. Use of biofeedback for headaches in adults was awarded "level 4-efficacious", the criteria for which were:

a. In a comparison with a no-treatment control group, alternative treatment group, or placebo control utilizing randomized assignment, the investigational treatment is shown to be statistically significantly superior to the control condition, or the investigational treatment is equivalent to a treatment of established efficacy in a study with sufficient power to detect moderate differences, and b. The studies have been conducted with a population treated for a specific problem, for which inclusion criteria are delineated in a reliable, operationally defined manner, and c. The study used valid and clearly specified outcome measures related to the problem being treated, and d. The data are subjected to appropriate data analysis, and e. The diagnostic and treatment variables and procedures are clearly defined in a manner that permits replication of the study by independent researchers, and f. The superiority or equivalence of the investigational

treatment has been shown in at least two independent research settings. [29] The task force included all studies in which biofeedback was used and found the therapy Efficacious. Later, in 2008 a review article on efficacy of Biofeedback in TTH quoted that BF in TTH can be supported as an efficacious and specific treatment option, which according to the Association of Applied Psychophysiology and Biofeedback(AAPB) and International Society for Neurofeedback and Research(ISNR), criteria this constitutes the highest level of evidence (Level 5), reserved for psycho-physiological interventions, that have established Level-4 evidence and have shown additional superior treatment results in comparisons to credible sham therapy or alternative bona fide treatments.[30]

The past three decades have shown, behavioral interventions (chiefly relaxation, biofeedback, and stress management) to have become standard components in the varied choice of treatments for management of migraine and tension type headaches. Meta-analytic literature reviews have consistently demonstrated clinically significant reductions in recurrent headache through behavioral interventions. Behavioral interventions have yielded approximately 35-50% reduction in migraine and tension type headache activity. Although comparisons between standard drug and non-drug treatments for headache have been initiated only recently, the available evidence suggests that the level of headache improvement with behavioral interventions may prove beneficial over those obtained with widely used pharmacologic therapies in representative patient samples. In recent years, some efforts have been made to increase the availability and cost effectiveness of behavioral interventions through alternative delivery formats and mass communications.[25,26] Biofeedback treatments for TTH provide patients with feedback of physiological processes, thereby assisting them to gain voluntary control over bodily functions by manipulation of physiological parameters (e.g., to reduce dysfunctional muscle tension, increase skin resistance etc.) and thereby augment self-efficacy in dealing with pain episodes.

Of all biofeedback therapies or techniques, EMG biofeedback has been extensively reviewed and used the most. A recent extensive and thorough meta-analysis including 53 studies concluded that biofeedback has a medium to large effect and the effect was found to be long lasting up to 15 months. GSR-BF has been used in treatment of stress [27] and related psychosomatic disorders like hypertension

[1], hyperhidrosis, Raynaud's disease, epilepsy etc. but has been infrequently used in management of TTH.

6 Brief Literature Review of the work (National and International):

Pharmacotherapy has remained the main mode of treatment of people affected with TTH. Though pharmacotherapy is modestly effective in the reducing the frequency and intensity of TTH, it has some evident drawbacks. First, the widely used antidepressant medications are associated with multiple potential adverse effects. Second, chronic TTH (CTTH) constitutes a risk factor for analgesic medication overuse and the development of medically induced headache in addition to the adverse effects due to long term consumption. [31]

6.1 Behavioral Treatments (Biofeedback)

Behavioral treatments have been recommended as an adjunct to pharmacotherapy. Of these behavioral treatments, biofeedback has formed an evidence based treatment option for TTH. These treatments involve the patient's active role in preventing and management of headache episodes and thereby improving the coping with the physiological and psycho-physiological consequences of pain. [31]

Previous quantitative reviews and meta-analyses have assessed the outcome of various behavioral treatments for TTH, such as cognitive therapy, biofeedback, relaxation and hypnotherapy and have shown average improvement rates that exceeded those of no treatment conditions.[32] The maximum treatment gains were achieved for electromyography feedback (EMG- FB) alone or in combination with relaxation, which is the predominantly applied biofeedback modality for TTH. Average improvement scores ranged from 46% to 61%.

One meta-analysis investigated psychological headache treatments and provided standardized measures of treatment success, which resulted in a medium to large average effect size for EMG-FB in adults. [32] Investigations of specific versus nonspecific effects of biofeedback in comparison with other behavioral headache treatments were not meta-analytically integrated in that study. Also, the long-term

effects of the efficacy on different outcome variables, and treatment mediators of biofeedback were not systematically analyzed.

These limitations were targeted in another meta-analysis whose objective was to present and up to date and comprehensive evaluation of the efficacy of biofeedback for TTH.

Its first aim was to establish the short and long term efficacy of biofeedback as well as the treatment specificity in comparison to various control groups. Another aim was to determine, differential treatment effects in the form of pain measures and of psychological, behavioral, and physiological outcome categories. In continuation, analyses of potentially moderating effects of treatment and patient characteristics were incorporated. Lastly, specific meta-analytical techniques were applied to control for possible confounding effects of selective publication, dropout, and study validity. Meta-analytic integration of 53 studies resulted in a significant medium to large effect size (d=0.73; 95% confidence interval=0.61, 0.84) that was stable over an average follow up phase of fifteen months. Biofeedback proved to be more effective than headache monitoring, relaxation therapies and placebo. The strongest improvements resulted for frequency of headache episodes. In addition, significant effects were observed for self-efficacy, muscle tension, depression, symptoms of anxiety and analgesic medication. The meta-analysis also found that biofeedback for TTH can be supported as an efficacious and specific treatment option. According to the AAPB and ISNR criteria this constitutes the highest level of evidence (Level 5), reserved for psycho physiological interventions. [31]

Andrasik reviewed meta-analyses and evidence-based reviews of behavioral treatments for headaches in adults. After considering all meta- analyses to date he concluded that the effects of behavioral treatments were superior to various control and placebo conditions and similar to current medications for both migraine and tension type headache. Combining behavioral and pharmacological treatments may increase effectiveness even further.

Several reports of unsuccessful biofeedback training have appeared in the research literature since the inception of biofeedback training three decades ago. Many of the unsuccessful studies conducted in the early development of the field reflect failure to thoroughly train the patients. For example, some

unsuccessful studies provided only minimal training with the biofeedback instrumentation (often one to four sessions of brief duration), offered little coaching, involved no home practice, and failed to conform to clinical criteria. [12]

Biofeedback is a time tested therapy for psychosomatic disorders. Various forms of biofeedback targeting the psycho-physiological parameters either directly or indirectly have been used in the treatment of TTH, namely EMG biofeedback, temperature biofeedback, GSR biofeedback, blood volume pulse biofeedback and electroencephalogram(EEG)biofeedback. Of these EMG BF is the most frequently used one and GSR BF has been used seldom.

6.2 EMG Biofeedback

A recent review article including 11 studies concluded that owing to low power of studies, the evidence to support or refute EMG biofeedback's role in TTH compared to placebo or any other treatments is conflicting. Since the conclusion was drawn from a small set of studies, its results cannot be generalized. Another critical review by Krishnan and Silver [31] on the meta-analysis by Nestrouric et.al found insufficient evidence to determine whether EMG biofeedback is effective in treating CTTH. It is difficult to comment on their outcome, since the conclusion was drawn from critical analysis of one meta-analysis only. An assessment conducted by National Institutes of Health (NIH) panel on efficacy of behavioral and relaxation therapies in chronic pain, established that EMG biofeedback was more effective than psychological placebo but equivalent to relaxation therapy for TTH.[22] When analysis was done to no treatment or to pseudo-placebo therapy, EMG-BF alone or combined with relaxation therapy were found to be more superior in a meta-analytic review of 78 articles with 2866 patients receiving cognitive feedback, relaxation therapy, EMG-BF or EMGBF in combination with relaxation therapy.

Another meta-analysis found a 48% decrease in headache activity in which EMG biofeedback/relaxation therapy was used with limited therapist contact. [22] Reducing therapist contact time with no loss in efficacy is an important consideration in terms of cost to the patient and in improving the confidence of the patient to cope with headache. Maintenance of the therapeutic effects of EMGBF is

an important consideration, which should not be overlooked. Nine TTH patients receiving EMGBF/relaxation therapy were followed up to 5 years after treatment. A headache index computed from the headache diary found that 78% of the patients remained improved. [21]

6.3 GSR Biofeedback

A thorough literature search yielded two studies using GSR biofeedback in tension type headache [23,24]. The study by Collet et. al was a comparative study between GSR feedback (n = 16) and Schultz relaxation (n = 15) in patients with tension headaches. They found no significant improvement in the group treated by relaxation at the end of the treatment whereas the group treated by GSR feedback showed significant improvements with respect to frequency and intensity of headaches and to anxiety as measured by subjects' self-evaluation ($p<0.05$). Intergroup comparison demonstrated a greater improvement in headache intensity for the GSR feedback group than for the relaxation group ($p<0.05$) at the post- treatment stage. Similarly, the percentage of patients showing at least 50% improvement as to headache frequency was significantly higher ($p<0.05$) in the GSR feedback than in the relaxation group. [17]

Another study by Pop-Jordanova and Zorcec employing GSRBF was done in a group of 59 children having tension type headaches, with mean age 12.5±1.24 years. The investigators found a high correlation between the emotional state of the children and the electro dermal (GSR responses) and EMG levels of frontalis muscle and trapezius muscle. The children underwent GSR and EMG BF training for 50 minutes per session once a week. After 20 sessions, the investigators found that there was a significant increase in electro dermal activity($p<0.01$) at the end of the treatment. Significant improvement in the GSR biofeedback groups in comparison to the control group was found in our study too. Three GSR groups received GSR auditory(GSRa), visual (GSRv) and combined audio-visual biofeedback group (GSRav). The control group was on medication only as prescribed by their treating doctor. A significant improvement was found in frequency, duration and intensity of headache ($p<0.01$). There was also a

significant drop in analgesic consumption at the end of six months in all the groups and improvement in SF-36 Quality of life total, physical and mental scores ($p<0.05$).

Guidelines for behavioral therapies

The clinical evidence review by Krishnan and Silver [33] in their review graded the evidence with EMGBF with or without relaxation therapies in CTTH as very low quality evidence which means that any estimate of effect with these therapies is uncertain. This was because most of the studies using EMGBF were inadequate quality studies, report incomplete results, lack consistent beneficial effects, have heterogeneity in techniques or are uncertain about the benefits of therapy.[34] Therefore to facilitate production of quality research evaluating behavioral therapies for management of primary headache disorders, guidelines were designed for clinical trials evaluating behavioral headache treatments by a workgroup of headache researchers under auspices of the American Headache Society.[24]These guidelines are complementary to and modeled after guidelines for pharmacological trials published by the International Headache Society, but they address methodological considerations unique to behavioral and other non-pharmacological treatments. Their main intention is to improve the design of trials and the reporting of results of studies on behavioral interventions for headache.

6.4 Measuring sites for EMG and GSR biofeedback

American Headache Society (AHS) recommends measurement of GSR from middle or distal phalanx of any two fingers or the palm. [23] Similarly, the psycho-physiological guidelines for techniques in measurement of electro-dermal activity, also recommends that electro-dermal resistance be measured form either middle or distal phalanges of two fingers, or thenar or hypothenar eminence of palmar surface. Many researchers have preferred middle phalanx to distal as it is thought to have less scarring and movement as compared to distal phalanx. In a review of articles from 1985 to 1990 in the Psychophysiology journal, the reviewers found that among 53 studies that used skin conductance as their dependent variable 18 (34%) measured skin resistance from distal phalanx, 10 (19%) from the middle phalanx, 14 (26%) from the palm and three (6%) from other sites; the remaining eight studies

(15%) did not mention the site of recording. Therefore, it was seen that maximum studies used either distal or middle phalanx for recording skin resistance. The variation of electro dermal responses recorded from the distal and middle phalanx was studied by the same group, which showed that distal phalanges were more electrodermaly active than middle phalanx and that distal phalanx provide a more sensitive measure of electro dermal activity than the middle phalanx.

On the contrary, Edelberg suggested that there are greater skin responses from areas of greater tactile sensitivity.[25] Ruch found that two-point discrimination is higher (distance between the two points to be discriminated/ recognized as two points) in fingertips meaning that, finger tips are more sensitive than middle phalanges. Therefore, these areas show greater skin responses. In addition to this there are greater numbers of sweat glands present on distal phalanx therefore giving a greater skin conduction response. Therefore in this study the distal phalanx of index and ring fingers are being used to assess the GSR activity, as used by investigators in a recent study in which GSR BF was used in stressed individuals. [1]

The most commonly used and popular placement of surface EMG (SEMG) electrodes for TTH is on the frontalis muscle. In our study, the EMGBF electrodes were placed 2.5cm above the centre of each eyebrow after appropriate skin preparation as was followed in a study by Cohen et al.

6.5 Outcome variables

As per the recommendation of the American Headache Society behavioral clinical trials workgroup, measure of frequency of headache should be reported as the primary dependent variable. The recommendation for headache frequency reporting is consistent with the IHS guidelines for controlled trials of drug treatments and will facilitate meta-analyses and other comparisons across studies of various interventions. The IHS clinical trials guidelines for migraine, prefer headache frequency to headache index because there is no consistent definition of headache index, and changes in this measure can be more difficult to interpret clinically. [35]

The guidelines have also mentioned a high desire for trials to include a sufficiently wide spectrum of secondary outcome measures to capture possible differential outcomes of drug and behavioural therapy. This is because, even if drug and behavioural therapies are found to exert a similar impact on the primary outcome variable, the impact of these two treatment modalities may differ on other measures of functioning (e.g., psychological symptoms, quality of life, efforts to manage headaches, etc.).[11] Identification of potential differences in the impact of the two therapy modalities requires the inclusion of outcome measures that assess a range of outcomes likely to be impacted by either therapy modality.[12] Moreover, studies have shown that genetic or family related environmental factors are associated with about 50% of all cases. Major life events such as surgery, divorce and deaths of close family members induce negative effect.

Such events in the prior year have been modestly related to the persistence of headache.[6] In addition to physical variables like muscle tension, electro-dermal activity, temperature, etc. and other demographic variables of pain, psychological risk factors have been empirically associated with the incidence of headache. These include life events, social support, hypnotisability, affect and negative thinking. [7] Trait negative affectivity is elevated in chronic headache and has been related to over reporting of somatic symptoms like headache pain, independent of organic disease. [8,9]. In spite of TTH being the most prevalent type of headache, little has been published about effect or burden of TTH on the health related quality of life (HRQoL). Most of the research on HRQoL has been focused on migraine. [11] Only a few studies pertaining to HRQoL have been done on chronic TTH patients in general population [11] or in specialized headache clinics [12].

Pain variables like frequency, intensity and duration of pain, can only provide information about pain but not the impact that it has on the patient's life. Above review suggests that TTH has an impact on physical and mental health of the patients, thereby affecting the quality of life in social life, at work place etc. causing impairment in overall functioning. Therefore, in lieu of this secondary outcome variable chosen in our study SF-36 QoL (Quality of life) total, physical and mental scores could cover a broader aspect of the physical, mental and social aspects of the patient which would represent the global health of the patient and impact of the headache on the patients' health.

In a population based study in Spain, the investigators found SF-36 to be a reliable and valid tool for measuring the health related quality of life of patients with chronic daily headache (CDH) and that it could be used as an effective tool in studying the effectiveness of therapeutic agents for CDH. Another, similar study done in the Italian population, found SF-36 tool was sensitive to clinical changes in patients with primary chronic daily headaches. A first of its kind survey, done on 901 patients with CDH, demonstrated that the SF-36 scores varied among headache diagnoses. The SF-36 scores were greatly influenced by psychological distress, as well as the percentages of the types of patients. Their findings also suggested that improvement in the pain profile as well as psychological well-being could predict a generalized improvement in the SF-36 scales in headache patients. Considering these studies, SF-36 QoL tool seems to be a fairly reliable tool to assess effectiveness of intervention in TTH patients as well.

The American Headache Society guidelines also urged the investigators to employ a daily self-report headache diary as their principal dependent measure for assessing treatment outcome whenever possible. Accordingly, a headache diary was given to all our subjects in which they reported the frequency, duration and intensity of every headache episode. They were asked to report the consumption of medications as well, which we reported as one of our secondary outcome measure. [36]

6.6 Concurrent v/s terminal biofeedback:

Biofeedback may be concurrent or terminal. Concurrent BF is information that is present all the time, a person is receiving BF therapy. Terminal BF is knowledge of results, coming after an action, and is more likely to assist in learning than is concurrent feedback. Giving concurrent feedback only intermittently to supplement terminal knowledge of results appears to be of probable value in permanent learning. [36]

7 Biofeedback Based Expert System Framework--Functioning and Experimentation:

See Appendices **'C'** for

C.1 Machine Learning

C.2 Machine Intelligence based Cognition and Conciousness

With biofeedback, the subject will be connected to sensors that help receive information about the subject's body. This feedback helps the individual focus on making subtle changes, such as relaxing certain muscles, to achieve the wanted results, such as reducing pain. Biofeedback gives people the power of their thoughts to control their body's activities and is often used as a relaxation technique. It appeals to many people for a variety of reasons; it is non-invasive, painless and can even eliminate the use of certain medications. During a biofeedback session electrical sensors monitor the body's physiological state, such as brain waves, skin temperature or muscle tension. [15]

This information is fed back to the subject via cues, such as a beeping sound, a flashing light, or even just watching the data recorded change in real time. The feedback teaches individuals to change or control their body's physiological reactions by changing thoughts, emotions or behavior. A typical biofeedback session can last from 30 to 60 minutes.

Biofeedback techniques can include:

• Electromyography (EMG) biofeedback which gives information about muscle tension to learn relaxation.

• Temperature (thermal) biofeedback allows an individual to see a drop in body temperature due to stress and start

relaxation techniques. [12]

• Galvanic skin response training which measure the activity of sweat glands and the amount of perspiration on the

skin, alerting you to anxiety.

• Heart rate biofeedback which enables control of heart rate in an effort to improve blood pressure, lung function,

and reduce stress and anxiety. [16]

In experiment, it is "hypothesis-driven" where we use a technique or techniques to alter some aspect of the subject's physiological parameters. This can include: reducing heart rate, sweating, altering body temperature and/or breathing rate. ECG, Skin Conductance, and Heart Rate. Parameters can be added or removed based on what the goal of the hypothesis is.

Biofeedback Suggestions: Note: All suggestions and techniques should be fully researched first to gain an understanding of the effect(s) it may have on your subject. Hypotheses and techniques must be approved by the instructor prior to any experimentation. It is also important to make sure the technique is applied and used properly.

• Deep breathing • Yogic breathing • Repetitive statements ("I am not cold", "I am not scared", "I am warm on a sunny beach", etc...) • Imagery (Note: images can be uploaded to the settings file using "Sequences") • Progressive muscle relaxation • Guided imagery and meditation Experimental Suggestions: • Subject is anxious after watching scary video clips. Use techniques that would allow the subject to reduce their anxiety levels. • Subject is warmed using a blanket; use techniques for cooling body temperature. • Subject is cold; use techniques for warming body temperature. • Subject is tense after being given a hard test (try the "Stroop Effect" or hard oral math questions). Use techniques that would relax muscle tension.

According to a recent survey, most elementary and secondary school students nationwide are stressed out by their academic records. Furthermore, most of high school students in Korea have to study under the great stress. Some of them who can't overcome the academic stress finalize their life by suiciding. [17] A study has found that it is one of the leading causes of stimulating the thought of committing suicide in Korean high school students. Main content of this research is to implement an EEG based music therapy. Music therapy can help the student deal with the stress, anxiety and depression problems. To do so scientists have developed EEG-based human emotion recognition algorithm. The training program works as a therapist. By using this brain training program, student can manage the stress easily without the help of expert. [12]

7.1 Proposed Machine Learning Framework

We assume that

Living Being = [Genome (Physical/ material Body) + Mind, Intelligence &

False Ego (Subtle Matter) + Spiriton (Spiritual Life Particle)] (Dr. T.D. Singh, ISCON**)** Here the Spiriton is the important component which decides the spiritual quotient of one. It is also denoted as the aura. It is responsible for the spiritual health of individual. Our proposed idea is to measure the different

clinic psychology parameters/ components responsible to affect the spiritons of physical body by above mentioned available instruments and try to heal self by different spiritual tools.

Fig.6- A Model of the Expert System

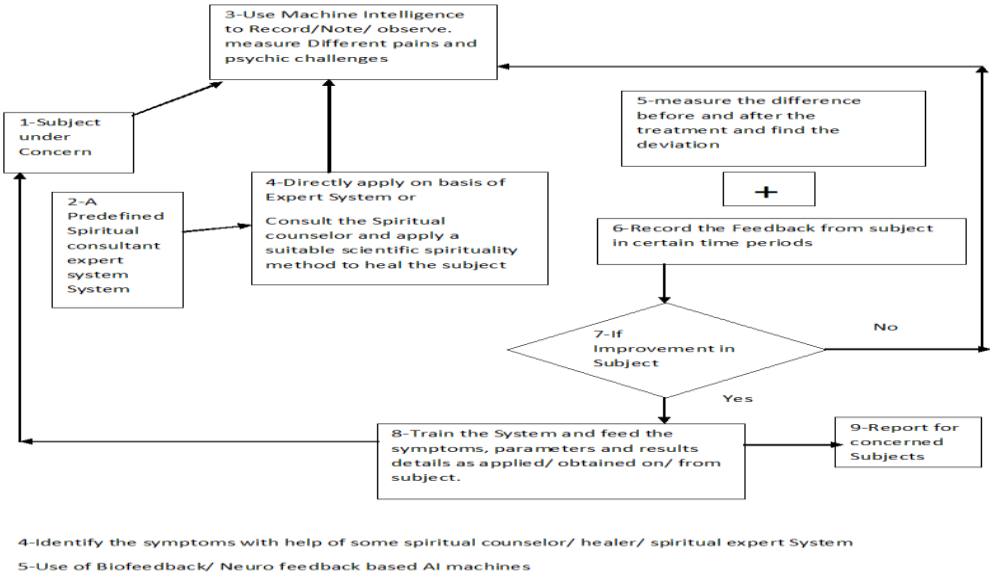


Fig.7—A Model to measure the Spiritual Fitness

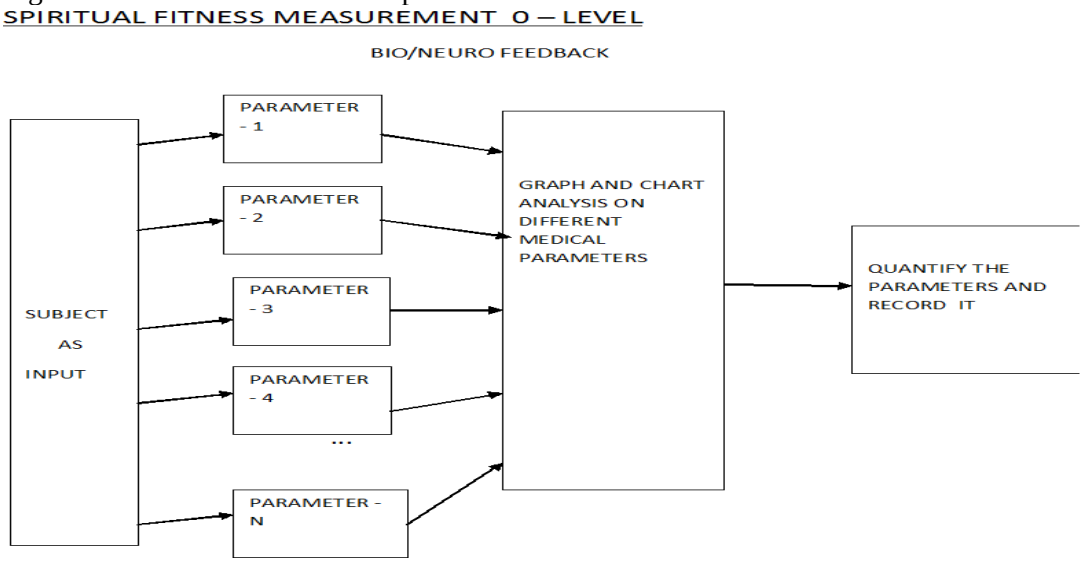


Fig.8- A Model of the Expert System-1 Level

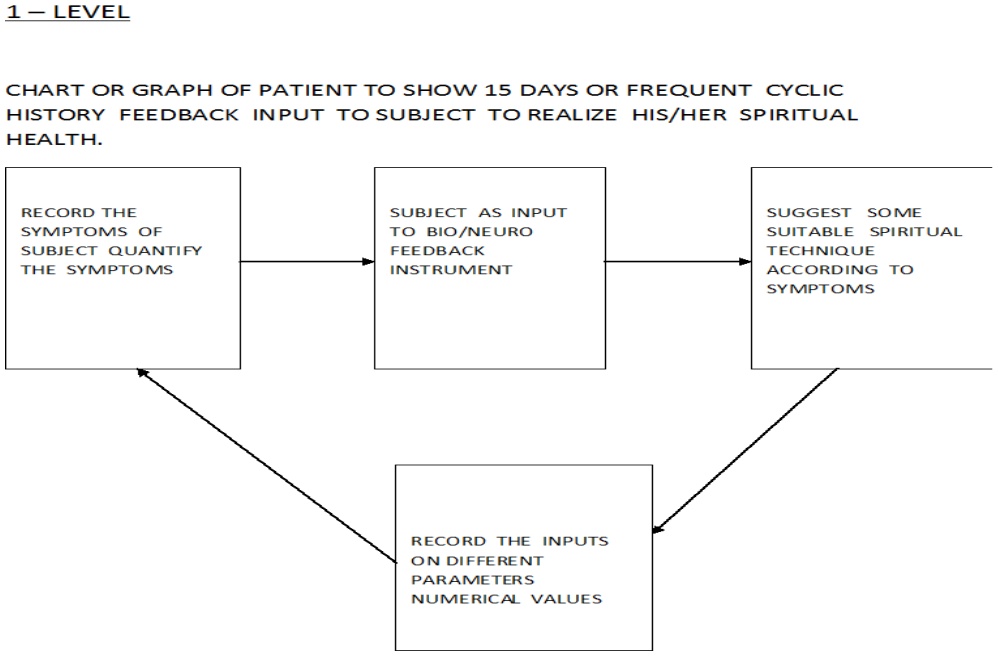


Fig.9- A Framework of the Proposed Model

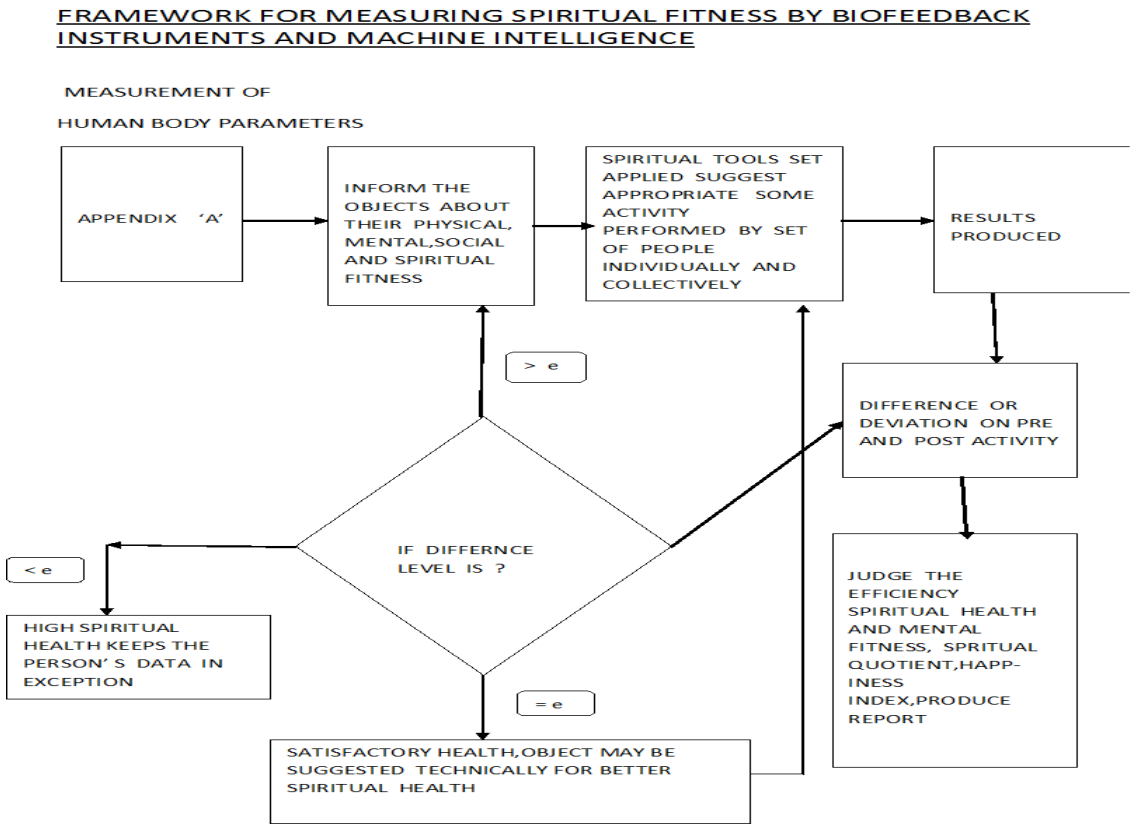


Fig.10 Flow Chart of the functioning

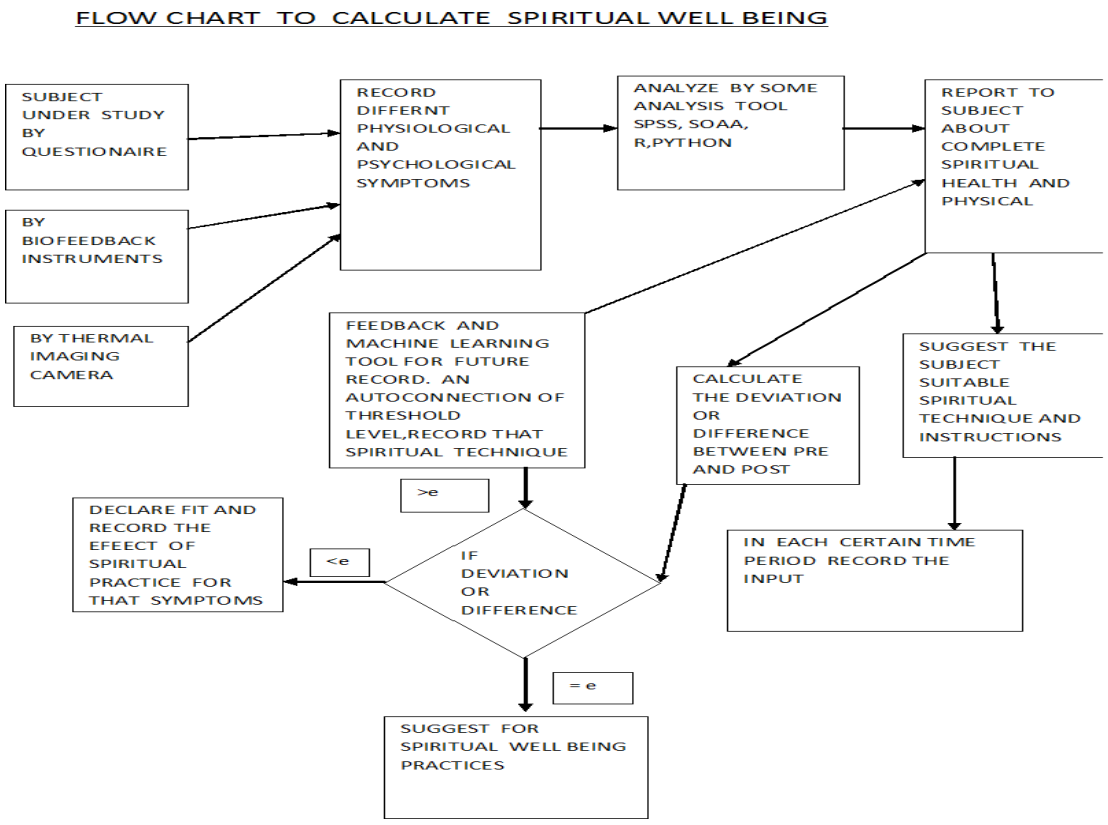
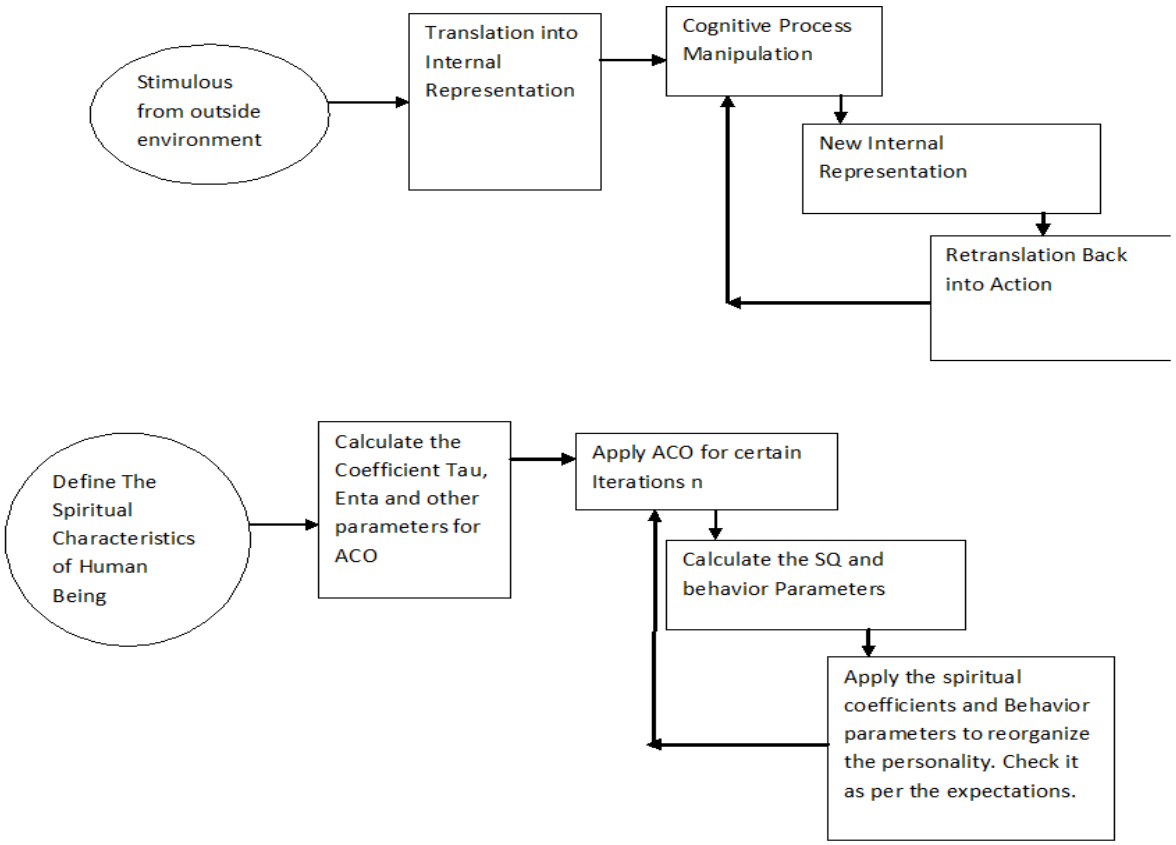


Fig.11-ACO Based Framework and applying our Spiritual Model



8 Problem Statement

Machine Intelligence using Different Sensor based Bio-Feedback Devices

To perform comparative study of biofeedback therapies (EMG and GSR mainly) for tension type headache treatment and enhancing capacity towards psychic challenges.

The working hypotheses of this study were:

a- Electromyography (EMG) biofeedback is more effective than Galvanic Skin Resistance (GSR) biofeedback in the treatment of tension type headache (TTH).

b- There is no difference in effectiveness of auditory, visual or combined EMG biofeedback in the treatment of TTH.

8.1- Background and Purpose: Tension type headache (TTH) is the most widespread and most common primary headache disorder accounting for nearly 90% of all headaches. Efficacy of electromyography

(EMG) biofeedback in patients with tension type headache has been extensively studied and proven. However, efficacy of galvanic skin resistance (GSR) biofeedback has not been studied adequately. So far there are no studies on the efficacy of isolated audio, visual and combined EMG or GSR BF in TTH. The aim of the present study is to compare the efficacy of electromyography biofeedback and galvanic skin resistance biofeedback in patients with tension type headache and to study and compare the efficacy of auditory, visual and audio-visual biofeedback in patients with TTH.

When you raise your hand to wave hello to a friend, or lift your knee to take another step on the Stairmaster, you control these actions. Other body functions -- like heart rate, skin temperature, and blood pressure -- are controlled involuntarily by your nervous system. You don't think about making your heart beat faster. It just happens in response to your environment, like when you're nervous, excited, or exercising. The Biofeedback technique can help you gain more control over these normally involuntary functions and the therapy is used to help prevent or treat conditions, including migraine headaches, chronic pain, incontinence, and high blood pressure. The idea behind biofeedback is that, by harnessing the power of your mind and becoming aware of what's going on inside your body, you can gain more control over your health.

This is a proposed work which deals with today psychic challenges which have threatened the human life. With the help of machine intelligence, we try to establish a framework which may work as an expert system and may help the individual to grow one as better human being.

Through a biological analysis of consciousness and concept of machine intelligence, A physical definition of consciousness has been proposed with the hope to model it in intelligent machines. It has been also proposed a computational model of consciousness driven by competing motivations, goals, and attention switching. We propose a concept of mental saccades that is useful for explaining the attention switching and focusing mechanism from computational perspective.

9-Objective of the Research work and Hypothesis:

AIMS AND OBJECTIVES

Aims

- To study and compare the efficacy of EMG biofeedback with GSR (Galvanic Skin Resistance) biofeedback in patients with Tension Type Headache.
- To study and compare the efficacy of auditory feedback, visual feedback and both visual and auditory
  feedback together.

Objectives

- To examine and compare the efficacy of EMG and GSR biofeedback in tension type headache patients.
- To compare the effectiveness of isolated visual isolated auditory or combined visual and auditory biofeedback together of EMG and GSR biofeedback in tension type headache patients.

Biofeedback can focus on a number of different things. In this study, biofeedback is going to focus on reducing stress. Stress can be anything emotional, mental, or physical that is straining a person. It must also be noted that biofeedback works better on those, who are willing to try it and willing to see it as an alternative source of healthcare. Reported information about a student's stress level will be taken from students who willingly practice biofeedback methods and information about stress from a student who does not practice biofeedback leading to the following hypotheses: "Practicing biofeedback will effectively reduce an individual's stress level".

In this context, objective of this work is to address the ethical issues of AI and explore the moral dilemmas that arise from ethical algorithms, from pre-set or acquired values. In addition, the proposed work will also focus on the subject of AI safety. As general, this work will briefly analyze the concerns and potential solutions to solving the psychic and ethical issues presented and increase readers' awareness on personal and mental health safety as another related research interest.

Study is being made with the aim of.

-To study the use of different Biofeedback instruments in clinical psychology and to analyze the effect of spiritual well-being.

-To validate the increasing productivity and efficiency of individual after spiritual activity.

-To measure the performance, decision / making capability, logical reasoning by happiness index and SQ.

-To study the reduction in frustration, depression and tension of students/ technocrats by spiritual fitness and

effectiveness of alternative therapies in fatigue, anxiety and sleeplessness.

-To study the socio-economic status of psychic disorders and the sufferings of survivors.

-To study the relationship between psychic patients with different demographical, social and cultural issues.

-To analyze the relationship between mental disorders and age and to help individual to deal with the mental health issues.

-To map the social relations (were the patient recognizes it?) between the Normal and psycho challenged

-To study how the urban physical and social infrastructure construct a psychosomatic issue in Delhi.

10. Methodology of Research work:

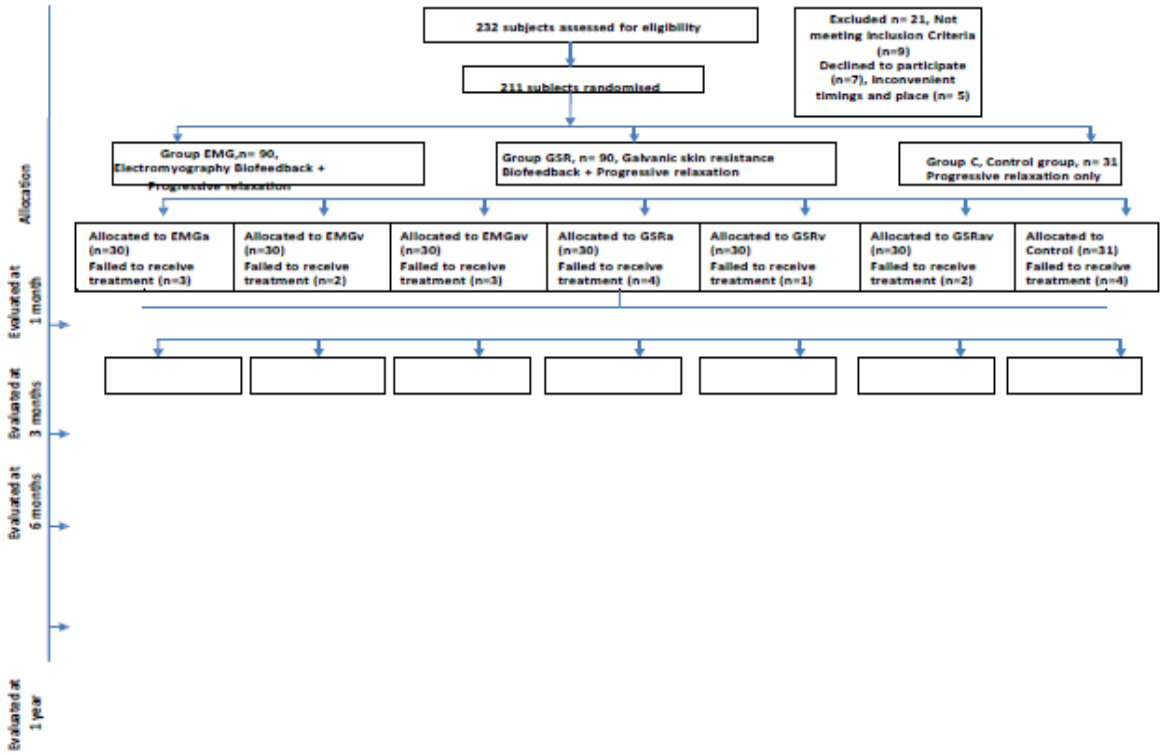


Fig. 12 Flow Chart of Subjects under Trial

a-Study design: This study was a randomized, single blinded, prospective controlled trial.

b-Source of data: Data will be obtained from the subjects recruited from various neurology clinics and subjects referred by neurologists to the outpatient department of Department of psychology, Devsanskriti Vishwavidyalaya, Hardwar, Uttarakhand and ABESEC, Ghaziabad for biofeedback therapy.

b-Study duration: Subjects will be recruited from July-2018 up to August 2019 and followed up till October-2019.

c- Informed consent: Subjects will be recruited in the trial only after obtaining informed consent from them. (Informed Consent Form approved by the ethical committee attached)

d- Ethical clearance: Ethical clearance will be obtained for grant by the ethical committee formed by ABESEC, Ghaziabad (Ref: ABES/17-18/D-10502)

e- Sampling design: Simple random sampling will be used with lottery method for allocation of subjects to seven groups. Subjects with stress and TTH will be enrolled in the study. Subjects who will not give consent and who will not meet the eligibility criteria will be excluded from the study. The rest of the subjects will be randomized using the lottery method for allocation. They will also be scrutinized after 30 days, 90 days, 180 days and 365 days.

f- Allocation procedure: Chits numbered one to seven were placed in a bowl and the subjects were asked to pick the chits. Subjects with the following chit numbers were allocated to the corresponding groups:

1: EMG auditory biofeedback (EMGa) group

2: EMG visual biofeedback (EMGv) group

3: EMG auditory +visual (EMGav) group

4: GSR auditory (GSRa) group

5: GSR visual (GSRv) group

6: GSR auditory +visual (GSRav) group

7: Control group

g-Sample size: Sample size was calculated using the following formula: [13,23]

$$N=2(Z\alpha+Z\beta)^2\times pq/(p1-p2)^2$$

Probability of Type I error will be set at 0.05

Power of the study is expected to set at 80% (0.8)

Let p1= 1.0 and p2=0.75 are the mean differences of pre and post (baseline to one year) average frequency of headache per month in the EMG biofeedback training group and pain management group respectively from a study by Mullay et al 2009.

Let p=0.875 was calculated as (p1+p2)/2 and q=0.125 was calculated as 1-p.

The sample size thus calculated was 26.6 per group. To accommodate for drop outs the sample size was chosen as 30 per group.

Universe and Sample

Methodology: This study will be a randomized single blinded controlled prospective study. We will select a no. of recruited subjects n, h (f and m males) will be randomly assigned to seven groups receiving electromyography feedback auditory (EMGa) (let n =27), visual (EMGv) (let n=28), combined audio-visual (EMGav) (let n=27), galvanic skin resistance biofeedback auditory (GSRa) (let n =26), visual (GSRv) (let n=29) and combined audio-visual (GSRav) (let n=28) and a control group (let n = 27). Each subject (except the control group) will receive 10 sessions of respective biofeedback for 15 minutes each in an isolated room. The control group will receive only medication prescribed by their treating doctor. Each patient will be kept blinded to the type of biofeedback (EMG or GSR) being given. Pain variables (average frequency, duration and intensity of headache per week), SF-36 quality of life scores will also be measured from survey to all n subjects.

All the psycho challenged cases living in Uttarakhand and NCR region (Delhi, Meerut, Ghaziabad, Faridabad, Gurugram, Modinagar and Muradnagar) will be the universe of study.

The college going students and Technocrats of different giant MNCs will be under study.

A control group of around 100 to 150 persons will be chosen and for carrying out this work the methodology employed shall be as follows: -

-Literature survey.

-Identification of the location (Cluster near the region of NCR-national capital region Zone) and perform the study of different given parameters of the psychosomatic disorders due to life deregulation which disturb one's complete health.

-Development of a model of Biofeedback based experiments which will be performed at Research Labs and Scientific Spirituality Centers of Dev Sanskriti VishwaVidyalaya, Hardwar and Patanjali Research Foundations, Uttarakhand.

-Experimental investigation of Mental and spiritual health will be on various medical parameters.

-We will Apply some spiritual techniques as per the symptoms observed, suitable to the patient as per his/ her age, diet, culture and habits.

-Data Analysis of the Comparative study of both EMG and GSR machines with various spiritual techniques (Guided meditations) will be applied over the patients and their performance.

-Analysis of the results obtained and verification of the efficiency of the technique and suggesting appropriate one will be done in repeated process in case the method doesn't work.

-Impact of the result obtained on the society, the employee, company/ college and environment.

25% area (approximately 25 wards) out of 103 wards will be selected as sample purposively.

10.1 Study Population

a- Inclusion criteria: Subjects to be included in the study are:

Subjects with headache fulfilling the criteria for TTH should lie down by International Headache Society.

• Both males and females between 18 to 65 years.

b- Exclusion criteria: Subjects to be excluded from the study are:

• Subjects who undergo complementary alternative medicine interventions in the past 6 months.

• Subjects with other headache types as described in International Classification of Headache Disorders (ICHD) - II classification.

• Subjects with the presence of more than one type of headache in addition to tension type headache.

• Subjects whose headache has begun after the age of 50 years.

• Subjects with serious somatic or psychiatric disease.

• Subjects with history of drug abuse or use of analgesics and triptans >10 days per month.

c- Intervention: After allocation of subjects to the seven groups, all subjects will be informed about the treatment procedure in detail. Biofeedback training is planned to be in an isolated room in Dev Sanskriti Vishwavidyalaya, Hardwar of Physiotherapy research laboratory, which has minimal lighting and external noise, to facilitate relaxation. All subjects will undergo respective (EMG/GSR) BF training for 15 minutes per session for 10 sessions. Subjects will undergo 10 biofeedback sessions with one session per day. If the subject misses a session, the biofeedback session will be provided when the subject reports for therapy again, avoiding interval more than two days between the sessions to avoid unlearning and deconditioning. The EMG BF will be provided using EMG-IR Retrainer (Chattanooga group Inc, U.S.A.) and GSR BF will be provided by GSR biofeedback Bio trainer GPF-2000 (Biotech, India).

EMG BF machine provides auditory and visual feedback. Auditory feedback is in the form of clicks which increases in frequency and becomes a continuous sound with increase in frontalis muscle tension and to no sound with relaxation of frontalis muscle. Visual feedback on the display monitor is in the form of glowing bars along with a numerical display which displays the relative EMG activity of frontalis muscle in figures. The number of glowing bars are directly proportional to tension in the frontalis muscle.

GSR BF machine similarly provide visual and auditory feedback. Visual display is in the form of glowing bars and numerical display of real time skin resistance in Kilo-Ohms. The increase in number of red glowing bars depict increase in tension (fall in skin resistance) and decrease in the number of red bars and increase in number of green bars indicate decrement in stress or tension (increase in skin resistance). Auditory feedback is similar to EMG i.e. in the form of clicks which become a continuous noise with increase in stress and to no sound with relaxation. The training will be given at 2% sensitivity with actual GSR. No changes in sensitivity will be made throughout the training sessions.

Skin preparation will be done prior to attachment of electrodes by cleaning the skin using spirit soaked cotton pad. After skin preparation surface EMG electrodes (Ag-AgCl, triode electrodes) will be applied 2.5cm above the center of each eyebrow[38] and the GSR electrodes will be applied on the middle phalanx of the index and middle finger. Both EMG and GSR BF electrodes will be placed on all the subjects including the control group irrespective to which group they belong or what training they are getting. The subjects will be unaware to whether they are receiving EMG BF or GSR BF. The investigator will be aware of the group the subject belong to and instruct the subject accordingly.

Both EMG and GSR BF auditory groups receive only respective auditory feedback. The subjects will be instructed to reduce the tone and frequency of the sound which would help them achieve relaxation. During the session, the monitor on which the visual display is present will be moved away from the field of vision of the subject.

Similarly, both EMG and GSR BF visual groups will be instructed to reduce the number of glowing bars. In case of GSR, to decrease the number of red bars and increase number of green bars to indicate relaxation. During the treatment session the volume of the auditory tone will be muted.

Both EMG and GSR audio-visual groups will be instructed to reduce the tone and frequency of sound as well as decrease the number of bars simultaneously.

Subjects in the control group will not be asked to manipulate either the visual or auditory display. They will only be informed that their stress levels is being recorded through the machines.

The subjects will be instructed to practice relaxation at home, both during the course of therapy and at the end of 10 sessions, in a way similar to the relaxation during the biofeedback therapy sessions. However, compliance of the subjects in the home program will not be not monitored. All subjects will be allowed to take the medications prescribed by their treating physicians especially if they are preventive/prophylactic medications. They will be requested to avoid taking any analgesic / abortive / palliative medication unless the headache is unbearable.

Outcome parameters:

d- Primary variables:

As per the recommendations of the American Headache Society Behavioral Clinical Trials Workgroup, 2005, the primary variables selected for our study were:

- Average frequency of headache per week
- Average duration of headache per week.
- Average intensity of headache per week.

The recommendation for headache frequency reporting is consistent with the IHS guidelines for controlled trials of drug treatments [39] and will facilitate meta-analyses and other comparisons across studies of various interventions. [38]

e-Secondary variables: The secondary variables considered in our study are

SF-36 Quality of Life – total, physical and mental scores.

Analgesic consumption.

These secondary variables are also termed as "secondary non headache measures" by the American Headache Society Behavioral Clinical Trials Workgroup, 2005.

f-Assessment of outcome variables:

The demographic data in regards to age, gender and chronicity of headache will be collected from all the subjects in the trial.

g-Pain Diary [38]**:** As per the guidelines of the American Headache Society- Behavioral Clinical Trials Workgroup, 2005, a pain diary will be given to all the subjects in which they will be asked to note down the headache episodes, duration and intensity of headache they experience in a week. At the end of the week, the averages of the headaches in that week will be calculated. The variables are recorded as:

1.Average frequency of headache per week: number of headache episodes per week.

2.Average duration of headache per week: total hours of all episodes of headache that week divided by the number of episodes in that week.

3. Average intensity of headache per week: average of the ten-point visual analogue score (VAS) per headache that week.

The subjects will also be requested to note down the use of analgesics during any of the pain episodes.

To assess the secondary variables, a licensed SF-36 questionnaire will be procured from Quality Metric Incorporated, USA in the regional language (Hindi) and in English. It is a multi-purpose, short-form health survey with 36 questions and yields a psychometrically based physical and mental health summary measures and a total score. The SF-36 will be judged the most widely evaluated generic patient assessed health outcome. [40] Its reliability has been estimated using both internal consistency and test-retest methods. Most of the published reliability statistics have exceeded 0.80. Validity studies generally support the intended objective of high and low SF-36 scores as documented in the original user's manuals.

Analgesic consumption will be recorded from the pain dairy of the subjects as well as from the prescriptions of medications given to the subjects by their treating physician.

h- Data collection:

All data will be collected at the following time measures:

Baseline: scores of primary and secondary variables in a week prior to the start of the treatment.

Scores at one, three, six months and one year were the scores of the last week of the corresponding month.

10.2 Study Conduction, Research Design and Data Collection Tool

-The Questionnaire will be planned as per study of Different Books.

-We will Design a control group. 7 groups will be generated lets each of 30 in class of 210 students.

One group will not participate in experiment and rest will participate under experiment, in regular touch and their feedback will be recorded.

Observations and readings will be recorded in regular intervals.

After some time, interval, calculate their difference level, benefit, deviation based on some set of questionnaires.

10.2a-The study will be conducted in NCR and Uttarakhand, covering a period of 2 years (2018-2020).

10.2b-Research Design: Exploratory and Descriptive

10.2c-Tools of Data Collection will be in- Other than Control Group will be undergone by Biofeedback instruments with depth interview-schedules, case study, ethnography and group interactions which would be used for redefining the very notion of psychic challenges.

Participatory observation would be the technique to explore the relation between gender equality and physical and social infrastructure of NCR. Sources of data will be primary and secondary. Python is an easy to learn powerful programming.

Official statistics on the National Capital Region would be used to set the background of the study. For the census survey to measure the prevalence of spiritual tools on psychic awareness in NCR, an adequate number of people would be surveyed cutting across caste, class, religion and location.

10.3 Statistical Analysis

SPSS version 16 and python programming using Anaconda framework will be used for analysis of data. Repeated measures analysis of variance (RMANOVA) will be performed since the data will be collected over various time measures. Data spherecity will be checked using Mauchly test and when significant differences are found, data will be corrected using Greenhouse Geisser correction. Post-hoc analysis will be performed with modified Bonferroni correction to find the point of significance for intragroup comparison and intergroup comparison. Consumption of analgesics over one year will be analyzed using Kruskall Wallis test and when significant differences is to be found Wilcoxson's signed rank test will be done to find the point of significance. Partial eta squared value (ηp^2) will be calculated for all primary and secondary variables to find the effect size at one-year intergroup analysis. Percentage improvement needs to be calculated by subtracting the monthly scores

from the baseline and dividing it by baseline scores. This end product will then be converted to percentage by multiplying it by 100. Significance for the results is required to be set at $p \leq 0.05$.

11 **The Testable Model of Spiritual Wellness:**

11.1 Machine Learning with Python language. Some features of python are: Simple, Interpreted, Free and Open Source, High Level, Portable, Object Oriented, Extensible

It uses following features for data analysis and training- Numpy and Pandas, Scikit Learn, Model Evaluation and Validation, Training and Testing, Metrics for Evaluation

11.2 Benefits of Python:

Most suitable for ML as Open Source- Open Software License with GPL compatible

Highly versatile- scikit-learn machine learning library, pandas for data munging, Numpy for data representation, matplotlib for visualization, Django for web application integration

Faster to develop- Easy to develop prototypes

Supported by Industry-Deep learning framework by Google (https://www.tensorflow.org/), Hadoop Streaming.

Steps for Windows 7 and above (32 or 64 bit)

-Download the graphical installer Anaconda for Windows:- https://www.continuum.io/downloads#_windows

-Double-click the .exe file to install Anaconda and follow the instructions on the screen.

-Requires 350MB RAM. (Optional)Add to PATH Environment variable: Anaconda2 Installation

-Dir \Lib & Anaconda2 Installation Dir \Anaconda2\Scripts

-Create PYTHONPATH variable and add Anaconda2 installation directory

See Appendices ‘D’ for

D.1 Anaconda Platform

D.2 ML Model, Life Cycle and Detailed Architecture

12 Human Health Performance related Data to be monitored:

In this work, data will be obtained from Biofeedback instruments and it will be stored in *.csv format. Different analysis will be applied on python Platform and machine learning algorithms will be used for training and testing. We will use Machine Learning Foundations: Mathematics and Science behind Machine Learning, Functions and Graphs, Statistics and its Applications with Probability Theory.

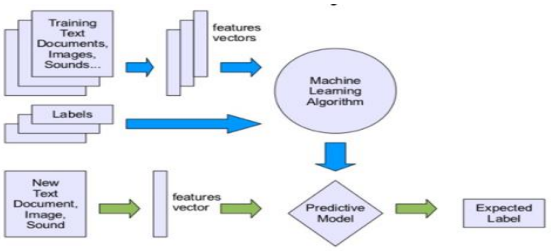


Fig.13 ML Process

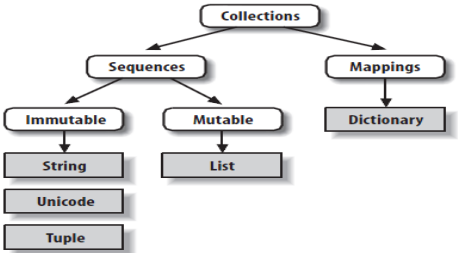


Fig.14 ML Datasets

Machine Learning Datasets

-The dataset in most classification and clustering applications is represented as p-dimensional vector space of numeric or categorical data.

-This feature space consists of n-samples.

-Each sample can be represented as a p-dimension feature vector consisting of p attributes of each data sample.

-Thus the entire dataset can be viewed as a n X p matrix.

Operations on arrays

Sorting, Searching, Finding Determinant, Dot product, Matrix Multiplication, Inverse of a matrix, Eigen values and Eigen Vectors, Solving linear equations

Classification library

-Scikit-learn (sklearn) is an open source software machine learning library for the Python programming language.

-conda update scikit-learn and it also uses sklearn.feature_extraction.text, sklearn.cross_validation, sklearn.naive_bayes, sklearn.metrics, sklearn.preprocessing.imputation

Classification Model

-The multinomial Naive Bayes classifier is suitable for classification with discrete features (e.g., word counts for text classification).

-Import the model

-from sklearn.naive_bayes import MultinomialNB

-class sklearn.naive_bayes. MultinomialNB(alpha=1.0, fit_prior=True, class_prior=None)

-Model Evaluation

-The sklearn.metrics module implements functions assessing prediction error for specific purposes Method/ description

-accuracy score (y_true, y_pred)/Computes accuracy classification score.

-classification_report (y_true, y_pred)

13 Thesis Outcomes and Novelty:

Following outcomes will be envisaged via various activities proposed under the research work: -

-Comparison of the efficacy of EMG biofeedback with GSR (Galvanic Skin Resistance) biofeedback in patients with Tension Type Headache.

-Comparison of the efficacy of auditory feedback, visual feedback and both visual and auditory feedback together.

-Use of different Biofeedback instruments in clinical psychology and to analyze the effect of spiritual well-being.

-Validation of the increasing productivity and efficiency of individual after spiritual activity.

-Measurement of the performance, decision / making capability, logical reasoning by happiness index and SQ and reduction in frustration, depression and tension of students/ technocrats by spiritual fitness and effectiveness of alternative therapies in fatigue, anxiety and sleeplessness.

-Effort to analyze the socio-economic status of psychic disorders and the sufferings of survivors and the relationship between psychic patients with different demographical, social and cultural issues.

-Clinical trial of predicting the relationship between mental disorders and age and to help individual to deal with the mental health issues.

-Mapping of the social relations (were the patient recognizes it?) between the Normal and psycho challenged to figure out how the urban physical and social infrastructure construct a psychosomatic issue in Delhi.

-Help to the individual to deal with the mental health issues.

-Making one able to recognize the basic symptoms in early stage.

-Improved knowledge on technology, Psychology, Spirituality and Medical sector.

Novelty in the proposed work:

The work has been planned with blending and merger of different disciplines and backgrounds like Spirituality, Medical and Computer science engineering with Clinical Psychology. They are merged together for a common interest and that is to make human consciousness uplifted. There are many pros and cons in philosophy but it's interesting to see that the complex concept like Life, personality, human behavior and mental growth is being defined mathematically and trying to be quantified. Present time, the psychic challenges are the biggest crisis. Research scholar has tried to present a quantitative approach for a subjective concept. The mathematical solutions for the human life related issues, spiritual wellbeing has been addressed and will lead to new direction of the study of human intelligence. Use of Effect of Spiritual Practices and Bio-statistical Analysis Shows Significant Improvement in many Physical, Physiological & Psychological Parameters.

14 Schedule of Activity:

-Literature survey (3 months)

-Identification of the location (Cluster in NCR) and perform the study of different given parameters of the Psychosomatic disorders and application of different healing techniques.

(3 months)

-Development a model of auto suggestive Biofeedback process and Spiritual fitness techniques for psychic challenges. (6 months)

-Experimental investigation of psycho issues in students and technocrats through a control group. (3 months)

-Comparative study and analysis of the EMG and GSR BF tools applied and their training on different dataset. (6 months)

-Analysis of the results on the basis of the differences of biofeedback parameters obtained in pre and post spiritual activity. (3 months)

-Impact of the result obtains on the individual, family, employer and society with environment. (3 months)

-Conclusion (2 months)

-Thesis writing (6 Months)

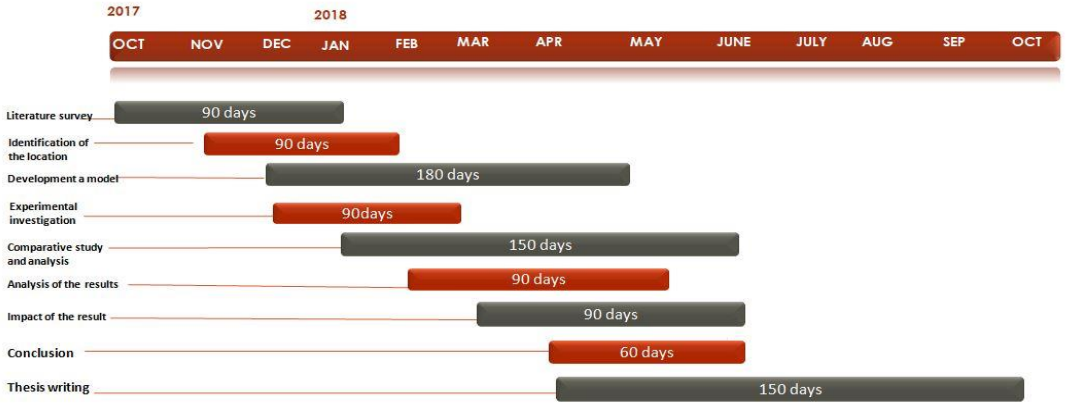


Fig. 15 Pert chart for the schedule of Activity

15 Impact of proposed research work in Academic/Industry:

15.1 Scientific spirituality is the need of today and it is now the topic of social and national importance:

Guaranteed strategies for improving one's relationships, increasing one's finances, getting control of one's emotions, and accessing one's own psychic and healing potential.

Powerful Tools to open the potential of one's mind - helps one to uncover hidden talents, one's inner power and the genius within him.

Proven yet uncommon methods - techniques already used by successful people - these methods will literally help one to create the life one wants. In general, the study of psycho disorders has been a neglected area of research. Here, an effort is made to conduct a deeper analysis of the issue that is turning the world around the career-oriented professionals/ technocrats/ students into an unsafe heaven.

Here the basic effort is to develop a sensor based modalities (Biofeedback instruments) for psychic awareness for the psychosomatic survivors in Delhi is the core of the research. It would help to see how different sections of population are differently affected by the crime of rape in Delhi. To study and suggest concrete measures to ameliorate the urban environment more conducive for gender equality and intellectual's freedom is the area of concern for the researcher.

The study also extends to know the impact of psycho challenges on the survivors, on students/ technocrats in general and on the society. What are the possible measures to bring the victims/ sufferers back into the mainstream and above all, how can this be mitigated if not vanished.

Therefore, this study will be a one-step further to combat problem of frustration/depression and tension and provide some solution. Hence, this study will add a new dimension to sociological literature also.

Other important benefit is true psychic development is not about learning how to do something new, such as crystal gazing, reading auras, etc. True psychic development is about removing the obstacles that are preventing psychic awareness from naturally occurring in the first place. And of course, many of these obstacles are deep in the subconscious and require special training to clear them away.

When We say obstacles, we are talking about limitations - limitations that come from emotional reactions, life-long beliefs, and the hidden effects of past trauma. There are also the limitations resulting from the controlling grips others have on us, and the other layers of programming we have picked up from parents, peers, the media, our educational institutions and the other sources of conditioning. It's not so that everything we've learned from these sources is negative; it's just that much of it can be limiting at times, especially when it comes to psychic perception.

15.2 True Psychic development

If we are stressed about money or a relationship, walking around with a pit in our stomach all day is the worst thing we can do. That emotional reaction will tend to manifest more of the thing we are trying to avoid. With proper training, we can shift our emotions and thoughts to where they need to be, rather than reacting out of control as most people do. For example, when one goes into a new job interview, one needs to emotionally radiate success, confidence, and achievement - not fear, neediness, and panic. A true approach to psychic development gives us the tools to do these things, along with opening up our connection to a greater spiritual intelligence.

So, as we can imagine, as we peel these limiting layers off, not only do we get the benefits of psychic awareness, but we gain better control of our personal space, which is another critical skill.

Now is The Time to Prepare, Not Later When It May Be Too Late:

It's time to take the steps to harness our psychic and personal growth potential. If we knew, we would likely have to build a house soon; one would want to go into that challenge without any tools? That would make it difficult if not impossible. Like is the same way, challenges will occur - it's inevitable. One has a choice to go into them empty-handed or with the powerful tools that will give one a better fighting chance.

As far as psychic development and personal growth, one has a few legitimate options. One can get started by picking up some of the more common books on these subjects from the local bookstore (Tony Robbins, Laura Day, Wayne Dyer, etc). It is suggested that one should work with a teacher on a personal level. There's an old saying "Trying to gain enlightenment by reading a book is the same as scratching an itch through your shoe."

Participants are encouraged for exploring the details of the Psychic Development. It’s a complete approach to personal growth and psychic development. This is the same training which increases the abilities and can convert average person, and with this training, one may be able to reach the point of providing services as a professional healer to police, CEOs, and others, which I have been doing for many years now.

Regardless of what path you choose, one should take a solid step towards personal growth and psychic development. One should do it as if his life depends on it. These skills could very well be the determining factor between his success and failure in his career, his relationships, and his personal happiness.

15.3 The Benefits of Psychic Awareness:

With true psychic/intuitive perception, one gains the ability to sense the true motivations and feelings of other people, regardless of how they present themselves to us. One can only imagine how helpful this could be in a new job interview or in a meeting with a new potential business partner. By using psychic awareness, one can gauge what points need to be discussed, when to say them, what not to say, etc.

With psychic awareness, one also gains the ability to look at a situation and see where it's heading six months or a year from now – one can see the details before one makes any commitments. One may see what is motivating the key people involved in your important life situations. When faced with a problem, one can gain the ability to psychically sense the best solutions, solutions that often can't be seen by just using intellectual reasoning.

Just to clarify, when we speak of psychic/intuitive awareness, we don't talk about something based on other people's body language, tone of voice, or your previous knowledge of a situation.

We are talking about a spiritual connection that goes beyond the limits of the physical universe. Because of this, psychic based information is as accurate about a circumstance a thousand miles away as it is about a situation/person in the same location as we are. We are also not talking about anything that has to do with witchcraft, fairies or crystal balls. We are talking about a natural innate human ability we all have access to, but most people never harness.

Now of course, most highly successful people already use psychic perception. They will often call it a gut feeling, hunch, intuition, or a sense, but it's all the same thing.

"Often you have to rely on intuition."**-Bill Gates Founder, Microsoft**

For Example, the person with psychic fitness when gets on the phone with someone who is a thousand miles away, without any previous knowledge, he is able to see what specific challenges the client is facing. He has to be able to see what the best route is for the client to take to get the results they want. He has to be able to do this without telling them anything about their circumstances or the options they have to choose from. He is able to do this because of his training and experience.

Because of the current economic challenges, which could escalate even more, one will likely be faced with the same dilemma. One will have to make decisions without having previous knowledge of the circumstances. Psychic perception will likely be the most critical, and maybe even the only survival skill you have in these types of situations. So one can see how important it is to develop this life-defining skill within you.

The proposed approach is a totally a new methodology to define the Human Life span, spiritual wellness, personality and behavior, the decision making in various walks of life journey, deciding good or bad, true or false, do or not to do, as usually we are in grip of these complex situations and our single wrong decision may move us to cashes, tensions and consequently to grieves. The results may be a helping tool for individual to check the spiritual quotient and decide one's personality and consequently take the important decisions in different circumstances.

This is one of the main reasons that it is so important to continually update our skills relating to interview and interrogation, read the latest information on detecting deception studies, knows to deal with persons of psychosomatic disorders, associate with professional organizations on and off-line, read professional trade magazines, and attend formal training courses and academic conferences. Humans are complex. We need keep learning more and more about them.

16 Conclusion:

As a human, we need mandatory training, from firearms training to domestic violence issues, to how to use the latest computer databases. That is all well and good, but one of the things that one performs the most, is TALK TO PEOPLE. And not just talk to people like in a social setting or a cocktail party, one has to talk to people in a way to elicit as much relevant information from them while assessing for

signs of deception and truthfulness. And one has to talk to people who are under stress, who has just been traumatized, who is under the influence of drugs or alcohol, who have elevated levels of anger and hostility, who may have memory issues, and who may or may not want to cooperate and provide them information. There are many, many more factors and complexities that make the "simple" act of communicating with and obtaining information from people so complex for the law enforcement professional.

The proposed work is a possible mathematical framework to calculate the human personal spiritual factor and direct the individual for better and noble life.

The present work, though limited in nature highlights that a significant proportion of youth has health impacting behaviors and conditions that affect their growth and development, that the problem is on the increase, many are interlinked and coexist, and likely to increase in the coming years. Some of the major health impacting behaviors and problems among the young people include under nutrition and over nutrition, common mental disorders including stress and anxiety, suicidal tendencies and increased suicidal death rates, increased consumption of tobacco, alcohol and other substance use, NCDs, high risk sexual behaviors including STIs and importantly, injuries mainly RTIs and violence. Many of these problems are closely linked to ongoing nutrition and epidemiological transition and are behavior related with a life course perspective.

There is a strong need for public health community to identify, prepare, integrate and implement activities that help to promote health and healthy lifestyles of young people and establish mechanisms for delivery of population-based interventions along with measuring its impact. There is a need to generate good quality and robust population data that can drive policies and programs. Strategic investments in health, nutrition, education, employment and welfare are critical for healthy growth of young people and these programs need to be monitored and evaluated for their efficacy and effectiveness using public health approaches.

17 Comprehensive Conclusions:

EMG biofeedback and GSR biofeedback (audio, visual and audio- visual) are effective in treatment of tension type headache. EMG audiovisual feedback is the most effective compared to other forms of biofeedback.

1. EMG and GSR biofeedback with auditory, visual and combined audio-visual forms is effective in treatment of tension type headache, improving the quality of life and reducing the analgesic consumption of patients with tension type headache.

2. EMG audio-visual biofeedback is more effective than other forms of feedback in treatment of tension type headache.

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Appendices

A Introduction

A.1 Intelligence of Machines and our 'Aatmik Abodhita' (Self Ignorance):

Machines are getting intelligent day by day. Almost all the work of inside and out are being executed with their help. Science has worked as boon to solve many complex problems and has made our life simpler, but in spite of this, there are certain issues and challenges, which need to be addressed as soon as possible. One of them is psychological problems of human being like stress, tension, depression, frustration, headache etc. which are now getting common in human personality.

Many times, the Human being is having the most deplorable ignorance about his own being. It usually remains in 'Aatmik Abodhita' or ignorance about Soul in human. i.e. at one hand, they don't possess any desire at all to get true knowledge about their soul and on other hand their own various pleasure-seeking low-love produce in their soul intense soul darkness. That introspection could not provide reliable evidence. Behaviorists insisted on studying only objective measures of the percepts (or stimulus) given to an animal and its resulting actions (or response). Behaviorism discovered a lot about rats and pigeons but had less success at understanding humans.

The proposed thesis work will be an effort to deal with machine intelligent techniques like Tableau Data Visualization tool, Python programming on Anaconda Platform and SPSS tools using sensor modalities of Bio Feedback therapies to deal with optimized methods of development of noble life in the perspective of Indian Scientific Philosophy and Psychology using various spiritual tools. Humans are complex! We need keep learning more and more about them [1].

A.2 Changes in Happiness over time—Findings from Euro Barometer:

The Euro barometer collects data on life satisfaction as part of their public opinion surveys. For several countries, these surveys have been conducted at least annually for more than 40 years. [5] The

visualization above shows the share of people who report being 'very satisfied' or 'fairly satisfied' with their standards of living, according to this source. [6] (Fig.3)

India ranks 122nd out of 155 countries in the World Happiness Report, behind its neighbors Pakistan and China. India is among the world's saddest nations, and became even less happy in the last year, showed a global ranking that identified Norway as the world's happiest country. [3]

A.3 Life Satisfaction:

Measuring feelings can be very subjective, but is nonetheless a useful complement to more objective data when comparing quality of life across countries. Subjective data can provide a personal evaluation of an individual's health, education, income, personal fulfillment and social conditions. Surveys, in particular, are used to measure life satisfaction and happiness [5].

Life satisfaction measures how people evaluate their life as a whole rather than their current feelings. When asked to rate their general satisfaction with life on a scale from 0 to 10, people across the OECD (Organization for Economic Cooperation and Development**)** gave it a 6.5 grade**.** Life satisfaction is not evenly shared across the OECD however. Some countries – Hungary, Portugal and Turkey – have a relatively low level of overall life satisfaction. [7]

B Need to Study IQ, EI and SI

B.1 Common Mental Disorders- A Challenge in India:

Studies conducted so far that at least 20 per cent of young people are likely to experience some form of mental illness - such as depression, mood disturbances, substance-abuse, suicidal behaviors, eating disorders and others [8]. A meta-analysis of five psychiatric epidemiological studies yielded an estimated prevalence of mental morbidity including 16 mental and behavioral disorders (classified into eight groups of organic psychosis, schizophrenia, manic affective psychosis, manic depression, endogenous depression, mental retardation, epilepsy, phobia, generalized anxiety, neurotic depression, obsession and compulsion, hysteria, alcohol/drug addiction, somatization, personality disorders and behavioral/emotional disorders) of 22.2 per 1000 population among 15 to 24 years[10].

Data available from community based studies on common mental disorders in India depict a high prevalence among the young people, but comparisons and extrapolations need to be cautiously made due to variations across studies. The prevalence of overall psychiatry morbidity (depression, conduct disorder, social anxiety, and panic disorder) among adolescents has varied from 12 to 16.5 percent. Pillai et.al observed a low prevalence of 1.8 per cent of DSM-IV disorders among adolescents aged 12-16 yr., which was attributed to methodological factors and the presence of protective factors [9].

A six years follow up study in Chandigarh showed the incidence rate of psychiatric disorder to be 0.18 per cent per year among the 10-17 yr. old adolescents. Among the few specific common mental disorders, the prevalence of depression has varied from 0.1 to 18.5 percent [11], conduct disorders from 0.2 to 9.2 per cent, and anxiety from 0.1 to 24.4 per cent across different studies.

Two studies showed prevalence of severe and extreme grade of depression in 11.2 per cent of the school dropouts and 3 percent among the school going adolescents aged 13 to 19 yr. and 18.4 per cent among the 9th standard students using Beck's depression Inventory. Promoting mental health and responding to problems on a continuous basis requires a range of adolescent-friendly health care and counseling services in communities [10].

Nearly 60 Million Indians Suffer From Mental Disorders[11]

At least 60 million Indians–a number more than the population of South Africa–suffer from mental disorders, even as the country lags the world in medical professionals and spending on mental-health issues.

Nearly 10-20 million (1-2% of the population) Indians suffered from severe mental disorders such as schizophrenia and bipolar disorder, and nearly 50 million (5% of population) suffered from common mental disorders like depression and anxiety at the end of 2005, Health and family welfare minister JP Nadda informed the Lok-Sabha (lower house of Parliament) in May 2016, quoting data from National Commission on Macroeconomics and Health, 2005, the last report available. India spends 0.06% of its health budget on mental healthcare. This is less than Bangladesh (0.44%). Most developed nations spend above 4% of their budgets on mental-health research,

infrastructure, frameworks and talent pool, according to the 2011 World Health Organization (WHO) report.[6]

While the central government does not maintain any dataset on mental patients, since health is a state subject, it does have data on patients in three central institutions: Another data set that captures the level of mental illness is the suicides that result.

B.2 Spiritual and Healing Tools to meet Psychic challenges:

The Scientific Spirituality- Scientific Spirituality is the basis of the Future.

It is the study of consciousness, the union of science and spirituality. At a superficial level, the two streams of knowledge, Science and Spirituality, both aimed at finding the ultimate truth, appear to be contradicting and nullifying each other's principles.

Science, developed on perceivable evidence-driven reasoning and logic, advocated that the attainment of truth is possible only with the help of material based scientific investigations and developments. Spirituality recognizes that the means of attainment of this truth lies within in the form of immortal soul, which is the Conscious Self. In other words, spirituality is the science of consciousness, involving mind, body and spirit relationship. A subject of divine faith and devotion, initially, it leads to realization of ultimate unity of all beings.

B.3 Effect of Spiritual techniques on Human Body and Holistic and mental Health

The advanced scientific applications range - from remote control of the space-crafts by electromagnetic waves; delicate surgeries to heavy metal cutting by the Lasers. Etc. clearly illustrate that it is not the equipment or the device but it is the 'power' of the (energy) waves that induces such wonderful effects. The supernatural effects of the supersonic waves generated by the *jap (*recitation) of mantras are more remarkable and are still beyond the reach of the advanced instruments (generators and the sensor devices) developed so far.

The divine or the evil thoughts generated by an individual mind influence the fields of thoughts in the surrounding by attracting the thought waves of compatible quality and repulsing those of the opposite quality. The thought waves form their own field of attraction that adds to the expansion of the

corresponding (divine or evil) currents of thoughts in the cosmic domains as well. Similar is the effect of the waves of consciousness generated by different kinds of sentiments and emotions.

The waves of thoughts or sentiments/emotions of an individual are strengthened in the similar (matching) fields traversed by them during their cosmic journey. And, because of the periodic nature of the movement of waves, they eventually reach back their origin. Completion of each such cycle amplifies the intensity of the associated good or bad effects. These inducing effects, though subliminal in nature, indeed play an important role in inspiring and shaping one's character and hence in building one's destiny too.

Spiritual and Alternate Powerful Healing Techniques Currently in Practice- Traditional

The effective spiritual techniques like Faith/ Pranic Healing, Mantra Vigyan- Effect of Different Mantras, (Gayatri Mantra, Hare Rama Hare Krishna , SatOm, Sohang), Guided Meditation-Dhyan, Jap-Mantra Chanting and alternate powerful healing methods such as Pranayam-Deep Breathing Techniques and Respiration Process, Aayurved/Alternative Medicine and Therapeutic Drugs, Swar Vigyan (Sound Science), Surya Chikitsa Vigyan(Sun-Ray Therapy), Naturopathy(Prakratik Chikitsa), Vrat-Fasting Techniques, Holistic Yog Therapy, Asan- Exercise Protocols, Satvik food and Nutrition-Diet patterns, Several different relaxation exercises are used in biofeedback therapy, including: Deep breathing. Progressive muscle relaxation -- alternately tightening and then relaxing different muscle groups.

Guided imagery -- concentrating on a specific image (such as the color and texture of an orange) to focus your mind and make you feel more relaxed.

Mindfulness Meditation -- focusing your thoughts and letting go of negative emotions.

B.4 Possible Human Factors/parameters to be measured by Biofeedback

High Resting Heart rate by ECG (Electrocardiogram) to measure HRV (Heart Rate Variability), Blood Pressure, reduced Vagal Tone, negative psychological and physiological outcomes, Alteration of predominant sympathetic activity, improving cardiovascular Health, Muscle Tension by EMG (Electro

Myograph), Skin Temperature by Thermal Imaging Camera, Brain wave activity by EEG(Electroencephalograph), respiration and breathing rate, Sweat glands by EDG (Electro dermal activity). [12]

When you're under stress, these functions change. Your heart rate speeds up, your muscles tighten, your blood pressure rises, you start to sweat, and your breathing quickens. You can see these stress responses as they happen on the monitor, and then get immediate feedback as you try to stop them. Biofeedback sessions are typically done in a therapist's office, but there are computer programs that connect the biofeedback sensor to your own computer. A biofeedback therapist helps you practice relaxation exercises, which you fine-tune to control different body functions. For example, you might use a relaxation technique to turn down the brainwaves that activate when you have a headache.

C ML Estimations

C.1 Machine Learning:

a-Statistics is just about the numbers, and quantifying the data. There are many tools for finding relevant properties of the data but this is pretty close to pure mathematics.

b-Data Mining is about using Statistics as well as other programming methods to find patterns hidden in the data so that you can explain some phenomenon. Data Mining builds intuition about what is really happening in some data and is still little more towards maths than programming, but uses both.

c-Machine Learning uses Data Mining techniques and other learning algorithms to build models of what is happening behind some data so that it can predict future outcomes. It's a particular approach to AI.

d-Deep Learning is one type of Machine Learning that achieves great power and flexibility by learning to represent the world as nested hierarchy of concepts, with each concept defined in relation to simpler concepts, and more abstract representations computed in terms of less abstract ones.

e-Artificial Intelligence uses models built by Machine Learning and other ways to reason about the world and give rise to intelligent behavior whether this is playing a game or driving a robot/car.

Artificial Intelligence has some goal to achieve by predicting how actions will affect the model of the world and chooses the actions that will best achieve that goal. It is very much programming based.

Machine Learning is the name given to generalizable algorithms that enable a computer to carry out a task by examining data rather than hard programming. It's a subfield of computer science and Artificial intelligence that focuses on developing systems that learn from data and help in making decisions and predictions based on that learning. ML enables computers to make data-driven decisions rather than being explicitly programmed to carry out a certain task. Math provides models; understand their relationships and apply them to real-world objects.

Fig. 1 Types of Machine Learning Algorithms

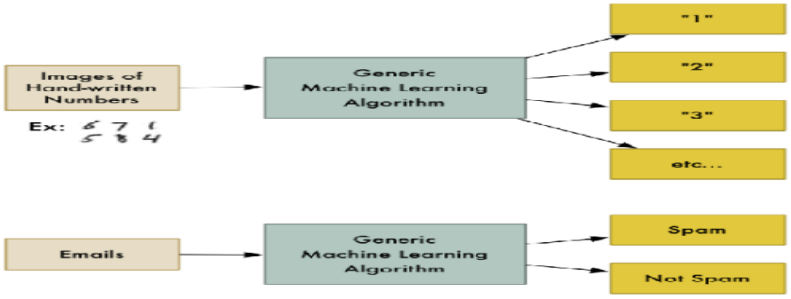
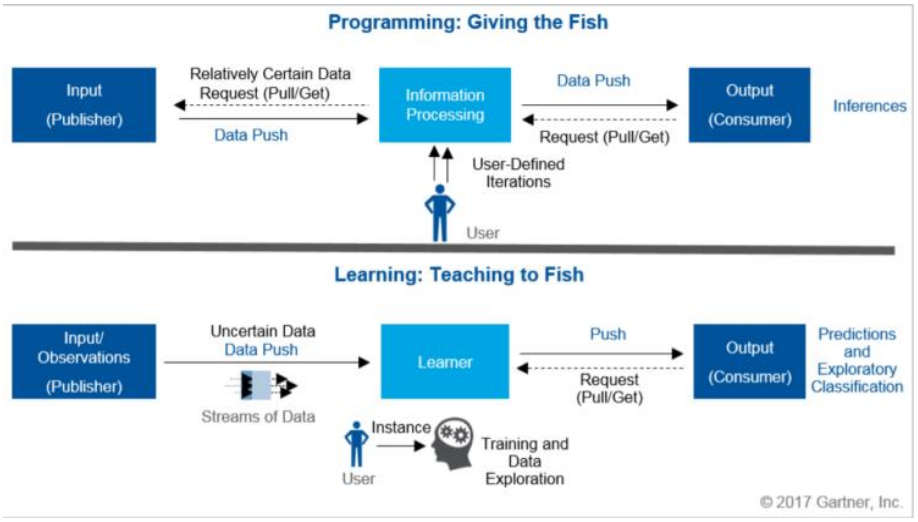


Fig. 2 Machine Learning Vs. Programming



a-Supervised Learning: These are "predictive" in nature. The purpose is to predict the value of a particular variable (target variable) based on values of some other variables or explanatory variables). Classification and Regression are examples of predictive tasks. Classification is used to predict the value of a discrete target variable while regression is used to predict the value of a continuous target variable. To predict whether an email is spam or not is a Classification task while to predict the future price of a stock is a regression task. They are called supervised because we are telling the algorithm what to predict. Methods are Linear Regression, Logistic Regression, Decision Trees, Random Forests, Naïve Bayes Classifier, Bayesian Statistics and Inference, K-Nearest Neighbor

b-Unsupervised Learning: These are "descriptive" in nature. The purpose is to derive patterns that summarize the underlying relationships in data. Association Analysis, Cluster Analysis and Anomaly detection are examples of Unsupervised Learning. They are called unsupervised because in such cases, the final outcome is not known beforehand. With unsupervised learning there is no feedback based on the prediction results. Methods are K-Means Clustering, Hierarchal Clustering, Clustering using DBSCAN, Feature Selection and Transformation, Principal Components Analysis (PCA)

c-Reinforcement learning: Where evaluations are given about how good or bad a certain situation is: Examples include types of ML that enable computers to learn to play games or drive vehicles. Methods are Markov decision Processes, Game Theory Fundamentals

d-**Deep Learning-** Methods are Tensor Flow, Deep Neural networks, Convolutional Neural Networks

C.2 Machine Intelligence based Cognition and Consciousness:

Consciousness is only marginally relevant to Artificial Intelligence (AI), because to most researchers in the field other problems seem more pressing. However, there have been proposals for how consciousness would be accounted for in a complete computational theory of the mind, from theorists

such as Dennett, Hofstadter, McCarthy, McDermott, Minsky, Perlis, Sloman, and Smith. One can extract from these speculations a sketch of a theoretical synthesis, according to which consciousness is the property a system has by virtue of modeling itself as having sensations and making free decisions.[37] Critics such as Harnad and Searle have not succeeded in demolishing a priori this or any other computational theory, but no such theory can be verified or refuted until and unless AI is successful in finding computational solutions of difficult problems such as vision, language, and locomotion.

Despite many efforts, there are no computational models of consciousness that can be used to design conscious intelligent machines. This is mainly attributed to available definitions of consciousness being human centered, vague, and incomplete.

Artificial Intelligence (AI) is an effective science which employs strong enough approaches, methods, and techniques to solve unsolvable real-world based problems. Because of its unstoppable rise towards the future, there are also some discussions about its ethics and safety. Shaping an AI-friendly environment for people and a people-friendly environment for AI can be a possible answer for finding a shared context of values for both humans and robots. [36]

Spiritual intelligence (S-intelligence) is able to engage with problems of meaning and value in order to solve them. In the present work, we studied the S-intelligence capacities that can be used to solve artificial intelligence (AI) problems. For this purpose, we proposed a new definition of problem solving that can manipulate spiritual aspects of the problems and conform to the requirements, conditions and capacity of S-intelligence models. Also we provided the definitions of S-intelligence, S-problems and S-methods for problem solving.

D The Testable Model of Spiritual Wellness:

D.1 Anaconda Platform:

-Anaconda is a freemium open source distribution of the Python and R programming languages for large-scale data processing, predictive analytics, and scientific computing, that aims to simplify package management and deployment.

-Its package management system is conda.

-Python forces programmers to produce uniform, regular, and readable code by aligning the code vertically in columns according to its logical structure. Uses Python Console, Idle, Spyder.

-Python comes equipped with interactive development environment (IDLE).

To run python: Interactive session: Select cmd and Type IDLE

-Spyder -> Select cmd and Type spyder

-Python implementation for

-Data Representation for ML

-Supervised Learning/Classification example

-Data Visualization

-Data Preprocessing

Supervised Learning

-Classification : An algorithmic method to assign any given new element of the dataset to one of a priori provided classes (categories).

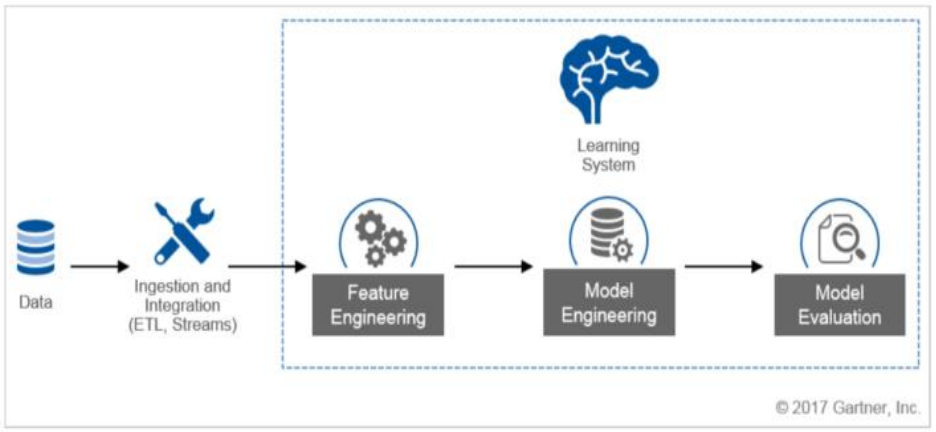
-Training set: Set of data used to train the classification model.

-Testing set: Set of data used to verify how well the model performs.

-It is common practice when performing a (supervised) machine learning experiment to hold out

Part of the available data as a test set.

D.2 ML Model, Life Cycle and Detailed Architecture:



Source: Gartner (January 2017)

Fig. 3 ML-Model and its Life-Cycle

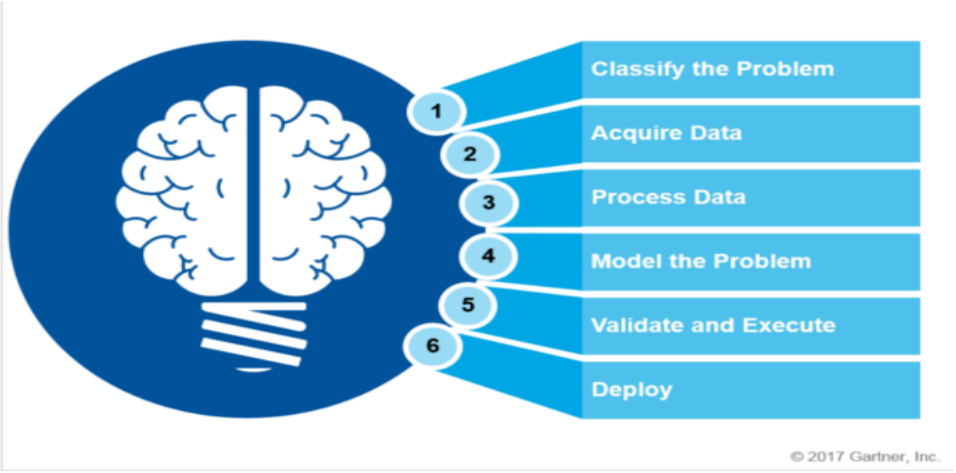
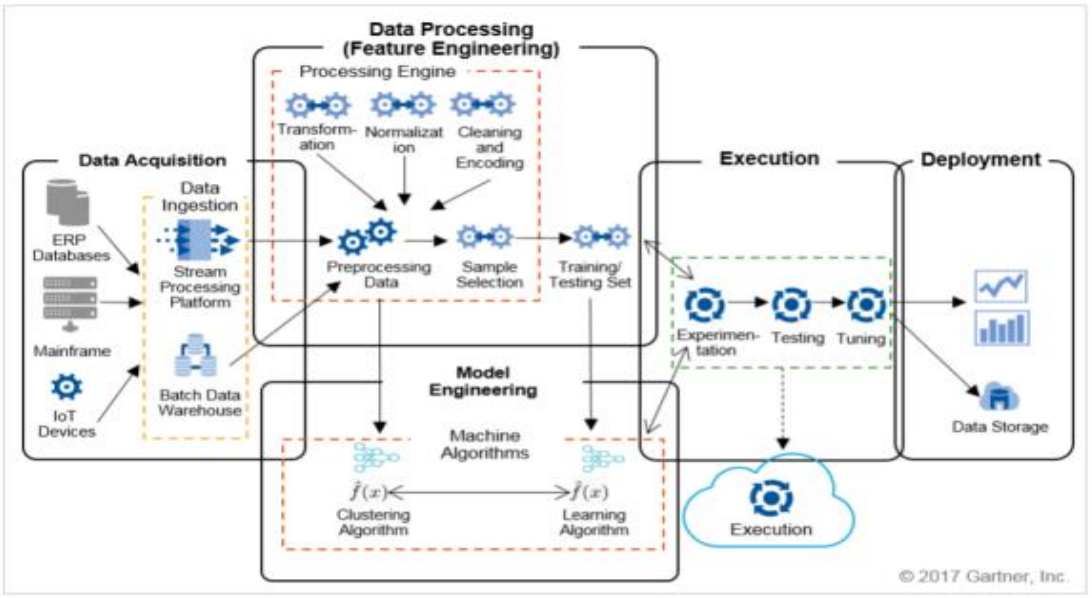


Fig. 4 Steps for the Data analysis with ML plateform

ML- detailed Architecture



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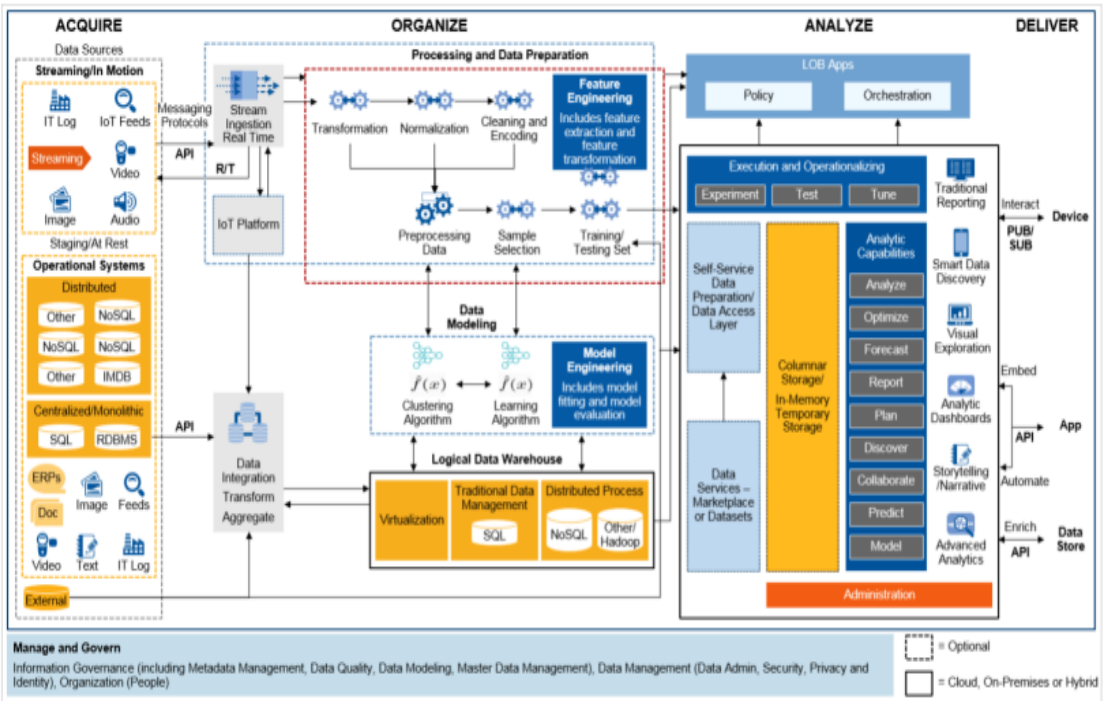

Fig. 5 ML Detailed Architectural Diagram and work process